EUROMOD WORKING PAPER SERIES

EM 01/21

Baseline Results from the EU28 EUROMOD: 2017-2020

January 2021

Baseline results from the EU28 EUROMOD: 2017-2020*

Jack Kneeshaw with

Diego Collado, Nicolo Framarin, Katrin Gasior, Holguer Xavier Jara Tamayo, Chrysa Leventi, Kostas Manios, Daria Popova, Iva Tasseva

ISER, University of Essex

Abstract

This paper presents baseline results from the latest version of EUROMOD (version I3.0+), the tax-benefit microsimulation model for the EU. First, we briefly report the process of updating EUROMOD. We then present indicators for income inequality and risk of poverty using EUROMOD and discuss the main reasons for differences between these and EU-SILC based indicators. We further compare EUROMOD distributional indicators across all EU 28 countries and over time between 2017 and 2020. Finally, we provide estimates of marginal effective tax rates (METR) for all 28 EU countries in order to explore the effect of tax and benefit systems on work incentives at the intensive margin. Throughout the paper, we highlight both the potential of EUROMOD as a tool for policy analysis and the caveats that should be borne in mind when using it and interpreting results. This paper updates the work reported in Kneeshaw (2020).

JEL: C15, H24, H31, H55, I3

Keywords: microsimulation, redistribution, tax-benefit system, poverty, inequality, work incentives

Corresponding author:

Jack Kneeshaw

kneejw@essex.ac.uk

* The results presented here are based on EUROMOD version I3.0+. EUROMOD is maintained, developed and managed by the Institute for Social and Economic Research (ISER) at the University of Essex and the Joint Research Centre of the European Commission, in collaboration with national teams from the EU member states. We are indebted to the many people who have contributed to the development of EUROMOD. The process of maintaining and updating EUROMOD is financially supported by the European Union Programme for Employment and Social Innovation 'Easi' (2014-2020).

We are grateful for access to micro-data from the EU Statistics on Incomes and Living Conditions (EU-SILC) made available by Eurostat under contract 259/2018-EU-SILC-LFS, the Italian version of the EU-SILC (IT-SILC) made available by ISTAT, the Austrian version of the EU-SILC made available by Statistik Austria, the Lithuanian version of the EU-SILC (PGS) made available by the Lithuanian Department of Statistics, the Greek SILC Production Database (PDB) made available by the Greek Statistical Office, additional indicator variables provided by the Polish Central Statistical Office (GUS), national SILC variables made available by the respective NSIs for Estonia, Luxembourg and Slovakia and the Family Resources Survey (FRS), made available by the UK Department of Work and Pensions (DWP) through the UK Data Service. Material from the FRS is Crown Copyright and is used with permission. Neither the DWP nor the Data Service bears any responsibility for the analysis or interpretation of the data reported here. An equivalent disclaimer applies to all other data sources and their respective providers cited in this acknowledgement.

Table of Contents

List of Figures 3
List of Tables 3
1. Introduction 4
2. The EUROMOD project 4
2.1 Updating input databases 5
2.2 Updating policy systems until 2020 5
2.3 Validation 6
2.4 County Reports 7
2.5 An important caveat for 2020: Covid-19 monetary compensation schemes and labour market transitions:
3. Poverty and inequality indicators with EUROMOD 7
3.1. Poverty risk: baseline year and trends 8
3.2. The effect of taxes and benefits on the risk of poverty 12
3.3. The effect of taxes and benefits on the poverty gap 17
3.4. The effect of taxes and benefits on inequality 20
4. Comparing EUROMOD estimates with external statistics 24
4.1 Comparison with external aggregate statistics 24
4.2 Why are poverty and inequality indicators estimated by EUROMOD different from those calculated using EU-SILC data? 25
5. Work incentives: estimates of marginal effective tax rates 29
6. Conclusions 35
References 36
Appendix 1. EUROMOD input datasets used in the analysis in this paper 37
Appendix 2. National teams contributing to EUROMOD I3.0+ 38
Appendix 3. Country notes: tax evasion and benefit non take up 39
Appendix 4. Country notes: Full year adjustments 42

List of Figures

Figure 1. Poverty risk and the role of public pensions and non-pension benefits and taxes (2017 incomes and policies) 14

Figure 2. Income inequality (Gini coefficient) and the role of public pensions and non-pension benefits and taxes (2017 incomes and policies) 21

Figure 3. Marginal effective tax rates 2017: share of population in paid work (%) byrange of METR 30

Figure 4. Marginal effective tax rates (%) by income component, 2017 32

List of Tables

Table 1. EUROMOD poverty and inequality statistics: 2017-2020 10

Table 2. Effects of tax-benefit components on poverty risk: 2017-2020 14

Table 3. Effects of tax-benefit components on poverty gap: 2017-2020 17

Table 4. Effects of tax-benefit components on Gini coefficient: 2017-2020 22

Table 5. Comparison of baseline poverty and inequality statistics: EUROMOD output (2017 incomes and policies) vs. Eurostat EU-SILC estimates 28

Table 6. Mean and median Marginal effective tax rates: 2017-2020 31

Table 7. Marginal effective tax rates by income component: 2017-2020 33

1. Introduction

EUROMOD is the tax-benefit microsimulation model for the European Union (EU) that enables researchers and policy analysts to calculate, in a comparable manner and based on household micro-data, the effects of taxes and benefits on household incomes for the population of each country and for the EU as a whole. As well as calculating the effects of actual policies it is also used to evaluate the effects of tax-benefit policy reforms and other changes on poverty, inequality, work incentives and government budgets.

The changes that it can be used to examine might be **actual changes in policy** over time, for example to show the extent to which reforms and other changes to public policies have contributed to reducing (or increasing) income poverty or inequality. Or they might be **alternative scenarios**, for tax-benefit policies and/or for the evolution of employment, hours of work etc. In particular, in the context of **Europe 2020**, EUROMOD provides the capacity for assessing the distributional and budgetary effects of proposed and implemented policy changes in each member state, as well as for exploring the implications of alternative reform strategies or alternative economic or demographic scenarios for risk of poverty at national and EU levels. Furthermore, it can be used to explore the between- as well as within-country distributional implications of potential EU or Eurozone social and fiscal policies.

EUROMOD is unusual in that it is **openly accessible**.[2] There are many applications and many potential users in both the scientific and policy monitoring/analysis communities. It is a highly flexible model, incorporating large amounts of complex information (Sutherland and Figari, 2013). For more information, see https://www.euromod.ac.uk/ .

This report presents baseline results for the 28 EU countries from the latest version of EUROMOD (I3.0+), being constructed with support from DG-EMPL of the European Commission. It updates and extends the material reported in a 2020 EUROMOD Working Paper (Kneeshaw, 2020).[3]

The next section provides a brief description of the EUROMOD project and its mode of working. This is followed, in section 3, by a presentation of estimates of poverty and income inequality for the 28 EU countries, calculated using incomes simulated by EUROMOD for 2017-2020 tax/benefits policies, based on micro-data from the 2018 EU-SILC. The calculations for 2017 provide the '*base year*', in which policy rules on taxes and benefits coincide with the income year of the corresponding SILC survey. Section 4 assesses the quality of the results produced by EUROMOD, and discusses why EUROMOD results may differ from statistics calculated using directly EU-SILC data on household income. Section 5 discusses estimates of Marginal Effective Tax Rates (METR) and their main components using EUROMOD. Section 6 concludes and presents the next steps for EUROMOD.

2. The EUROMOD project

The annual EUROMOD update project involves 4 key tasks: (1) updating the input database, (2) updating policy systems to the latest year (here, for 2020), (3) validating the baseline outputs and (4) documenting the work in Country Reports. These are described briefly in turn in the following paragraphs.

[2] Subject to permission to access the input micro-data (EU-SILC).

[3] https://www.euromod.ac.uk/publications/baseline-results-eu28-euromod-2016-2019

2.1 Updating input databases

The aim of this task is to build input databases for all countries from the most recent EU-SILC UDB. However, in most countries, the UDB does not contain all the information needed to inform tax- benefit calculations. Where possible, and with the explicit permission of Eurostat, we have therefore explored the possibility of merging variables from the underlying national data (often referred to as the "national SILC") into the EUROMOD input database obtained from the UDB. However, access to the merged data for external EUROMOD users is subject to approval by Eurostat, by the National Statistical Office in each country, and requires negotiation between the EUROMOD team and the users on a bilateral basis. As documented in Appendix 1 in some cases this has been straightforward; in other cases the process is still ongoing.

In some countries, it is possible to use the "national SILC" as an alternative (rather than a supplement) to the UDB. We have only followed this route in cases where these data are provided for research uses under reasonable contract conditions; where they contain the necessary detailed variables; and where they yield the same results as the UDB for some of the key social indicators (e.g. median household disposable equivalised income; at-risk-of-poverty rates).

With only the UDB variables, the values for the individual components of many of the harmonised income variables used by EUROMOD must be imputed. The process depends on the specific components that have been aggregated (and a first step is to establish what these are: this information is not part of the standard UDB documentation). It obviously involves approximations and has implications for the results.

The baseline results presented in this report are based on:

(a) SILC 2018 for all EU-28 countries except the UK
(b) Family Resources Survey (FRS) 2017/18 for the UK

2.2 Updating policy systems until 2020

Based on detailed descriptions of policies provided by national teams, 2020 policies have been modelled using the EUROMOD tax-benefit modelling "language" for each country. Together with updating factors, to bring 2017 incomes from 2018 EU-SILC input data up to the level corresponding to the following policy years (2018, 2019, 2020), it is now possible to simulate tax/benefits policies from each of these 4 policy years for each of the 28 EU countries. These alternative "baselines" also form the starting points for modelling possible reforms, making use of the EUROMOD language.

The aim is to simulate as much as possible of the tax and benefit components of household disposable income. In practice, some parts of the tax or benefit system may be difficult to simulate and in that case the component is taken directly from the input database. This applies in the case of many contributory benefits and pensions (since information on past work and contribution history is not available in the EU-SILC or most other cross-sectional survey data sources) and many disability benefits (since information on the nature and severity of the disability is not included in the UDB data). The extent of these types of benefits varies across countries. For example, in some countries it is possible to simulate non-contributory pensions; on the contrary, in countries where such pensions do not exist, pension systems cannot be simulated.

In some other cases, benefits can only be partially simulated; using assumptions based on the information available in the data, for example, entitlement to unemployment benefits is simulated using information on reported receipt of the benefits in the EU-SILC. In some countries, the user can

choose whether to use the simulated values of unemployment benefits or the values inputted from the data in their analysis. In these cases, the default is to make use of recorded values in analysis of income distribution, but to use simulated values when calculating indicators such as replacement rates or welfare resilience indicators.[6] Complete details of the benefits and taxes fully or partially simulated in this paper, and of those which are instead taken from the input data, are provided in the Country Reports.

2.3 Validation

Three distinct types of validation are usually carried out before the release of baseline results. First, as part of the policy implementation, the coding of the rules governing each policy instrument as well as the interactions between instruments were checked using a range of built-in tools. This is known as "micro-validation".

Secondly, once a country component in EUROMOD is working satisfactorily, aggregate estimates for expenditure on each benefit and revenues from each tax are compared with official external sources, such as national administrative statistics. Where available, the numbers of recipients and taxpayers are also compared against external data. This "macro-validation" also helps to spot errors and problems in the implementation (either in the policy rules or the data, or in both). Once finalised, a report on the "macrovalidation" is included in each Country Report, to inform model users about how the baseline results from EUROMOD correspond to other external statistics, and discusses the reasons behind the differences.[7]

A third type of validation takes place when the model is used comparatively across-countries. Whether a discrepancy can be considered large or small (important or unimportant) sometimes becomes clearer in cross-national perspective. In addition, unexpected differences in distributional indicators between countries can point to possible problems in the implementation of certain taxes and benefits, or to country specific factors related to the nature of taxes and benefits. An example of such an exercise is presented below, comparing baseline EUROMOD results with Eurostat statistics calculated directly from the EU-SILC.

Two main issues arise when validating macro statistics from EUROMOD: tax evasion and non-take up of benefits. Assuming full knowledge of and compliance with policy rules tends to result in over-simulation of taxes and of benefits and hence to under-estimate inequality of disposable incomes. At the same time, estimates based on the assumption of full compliance and benefits full take-up can be interpreted as the "de jure" or intended effects of the system.

In this paper, we model benefit non-take up and tax evasion using a country-specific approach, relying on the best available information from external administrative data. At the same time, we attempt to make our modelling as transparent as possible, by enabling external users to switch off (or modify) the model components specific to tax evasion and take-up, depending on their research objectives. Tax evasion adjustments are included in the models of Bulgaria, Greece, Italy, and Romania, while benefit non take-up is modelled for Belgium, Estonia, France, Spain, Ireland, Greece, Croatia, Latvia, Poland, Portugal, Romania, and Finland and United Kingdom. See Appendix 3 for a country-by-country description of the treatment of these issues.

[6] For example, see Fernandez Salgado, Figari, Sutherland and Tumino (2013).
[7] It should be noted that external statistics are often available only with a time lag (e.g. macro-validation of 2020 policies typically cannot be finalised until late 2021). Country Reports will document these issues.

In addition, it needs to be noted that EUROMOD implements policies as they were on the 30th of June. In some cases where major reforms happen for example on the 1st of July the policy effect will not be captured in EUROMOD which can also have an effect on the validation results. However, to capture these types of measures some countries have implemented 'full year adjustments', which are intended to simulate situations where policy instruments were in effect for only a part of the year. Appendix 4 describes where these types of adjustments have been implemented. However, by default they are off when calculating the baseline results.

2.4 County Reports

Each national team, as shown in Appendix 2, has produced a Country Report conforming to common guidelines in terms of style and content. The intention is to provide comprehensive documentation for EUROMOD users and serve as reference for developers and national teams in the future.[8]

2.5 An important caveat for 2020: Covid-19 monetary compensation schemes and labour market transitions

In an ordinary year, *incomes* in the input data are uprated from the year that they are reported for (i.e. SILC year-1) to the policy year that is being analysed (e.g. 2017 incomes from the 2018 SILC are uprated to 2020, if that is the policy year that we are interested in). At the same time, it is standard practice in EUROMOD for the input data populations to remain the same: demographic (e.g. increased migration) and socio-economic changes (e.g. increased unemployment) that might have changed the distribution of households or their original incomes are not accounted for. Again, in an ordinary year, this works satisfactorily: system shocks are much rarer than incremental change.

However, for 2020, all 28 systems suffered shocks to some extent and labour market disruptions were in many instances substantial. **Abstracting EUROMOD results from these disruptions should therefore be undertaken with more care this year than in previous years**. Indeed, it is for this reason that the 2020 policy systems in the EUROMOD public release (version I3.0+) contain simulated labour market transitions - defined in policy TransLMA_cc - that can be used to transit individuals into a country's monetary compensation scheme (where appropriate) and into unemployment (where appropriate). The policy only produces results if the model is run in combination with the EUROMOD software's Labour Market Adjustment (LMA) add-on. Users are encouraged to refer to the Simulating labour market transitions in EUROMOD document that accompanies the public release of the model prior to using the policy and add-on.

Nevertheless, the nature of these simulations is still experimental and only partially validated. For this reason, the labour market transitions policy is switched OFF in EUROMOD baselines. **As a consequence, the simulation of monetary compensation schemes does not produce any effect in baseline simulations, including those in this report**. Since all policies not linked to labour market transitions are fully functional (including Covid-related policy responses that fall outside the monetary compensation schemes, e.g. greater generosity for existing benefits or tax cuts), it is, for example, possible for disposable income in 2020 to be higher than disposable income in previous years. Falls in the poverty risk for Lithuania in 2020 – see Section 3.1, below – are a good example of this 'static' policy effect, which does not account for a rise in unemployment. Interpretation of the 2020 results for all countries presented here should bear this in mind.

[8] The country reports are available at https://www.euromod.ac.uk/using-euromod/country-reports/

3. Poverty and inequality indicators with EUROMOD

Policy systems for years 2017 to 2020 are simulated in EUROMOD allowing the analysis of the effect of policy changes on income distribution. Table 1 shows selected poverty and inequality indicators for these policy years. Risk of poverty rates for the whole population of each of the 28 EU countries are shown for three poverty thresholds: 50%, 60% and 70% of national median equivalised household incomes (using the modified OECD equivalence scale). Risk of poverty for children (aged under 18) and older people (aged 65 or more) using the 60% threshold are also included. A commonly used indicator of income inequality is also shown: the Gini coefficient.

The one area that EUROMOD is especially designed to address is the role of taxes and benefits in reducing inequality and poverty risk. Tables 2, 3 and 4 show the effects of various tax and benefit components on poverty risk, poverty gap and inequality (as measured by using the Gini coefficient) between 2017 and 2020.

Note that for Tables 2 and 3 the poverty threshold is the same throughout, using 60% of median household disposable income in the respective year. The poverty threshold stays constant as income components are added and subtracted in order to highlight the role played by the component in poverty reduction. Columns 3-7 in Tables 2 to 4, show what happens to poverty and inequality if each component (means-tested benefits, non-means-tested benefits (not including public pensions), taxes and social insurance contributions) is added back (in the case of taxes) or deducted (in the case of benefits), in turn, from disposable income. Column 8 depicts poverty and inequality estimates on the basis of original income and column 9 presents what happens to these indices when public pensions are added to original income. The role of public pensions (in contrast with that of direct taxes and non-pension benefits, which are usually considered to be the main instruments of redistribution) is also graphically illustrated in Figures 1 (effects on poverty risk) and 2 (effects on inequality).

Results for all years are based on the same input database, so do not capture the effects of changes in population composition and characteristics. In each case, we have calculated the indicators using the same methods in principle as Eurostat although, as explained in section 5, there are a number of reasons why the values may differ from those produced by Eurostat from the EU-SILC data directly.

Incomes that are not simulated (e.g. market incomes) are updated from the base year 2017 to the following years based on indices for each separate income source (e.g. earnings indices for earnings, pension uprating indices for pension-related incomes). These tables show how poverty and inequality indicators evolve over time in each country, as a result of policy changes and changes in income levels, abstracting from changes in socio-demographic characteristics of the population, which are kept constant as in the base year.

3.1. Poverty risk: baseline year and trends

Table 1 shows the evolution over time of the poverty threshold, defined as 60% of the median equivalised household disposable income, in nominal terms across countries. In this analysis the poverty line can shift because of inflation, changes in market and non-market incomes, tax and benefit policy reforms and uprating of policies over the period considered. In the non-euro-zone countries, poverty thresholds, which are expressed in euro, can also be affected by fluctuations in the exchange rate.

The countries experiencing the largest average annual growth in the poverty line between 2017 and 2020 are: Lithuania (8.8%), Estonia (8.0%), Romania (7.9%), Latvia (7.8%), Bulgaria (7.3%), Poland (5.5%), Slovakia (5.3%) Czech Republic (5.0%). A number of countries experienced a slightly lower annual shift in the poverty line of between 2% and 4%: Austria, Belgium, Germany, Greece, France, Croatia, Ireland, Malta, Netherlands, Portugal and Slovenia. On the other hand, the poverty line has not moved substantially in Denmark, Spain, Finland, Hungary, Italy, Luxembourg and Sweden where the average annual growth rate remained below 2%, with the threshold moving barely at all in the United

Kingdom over the 3 years. Finally, the poverty line in one country has dropped in nominal terms: Cyprus (though by less than -0.1% on average per year).

Table 1 shows that the highest at risk of poverty rate using the 60% poverty line in the base year 2017 is observed in Romania (24%), followed Bulgaria, Hungary, Latvia, Lithuania, Estonia, Spain and Italy (above 20%) and Croatia and Greece (above 17%). The lowest poverty rates (below 12%) are registered in Netherlands, Belgium, Luxembourg, Denmark, Slovakia, Finland and Czechia (9.2%). The ranking of countries at both the top and at the bottom of the league-table seem to remain stable when considering alternative poverty thresholds (50% and 70% of the poverty line). Poverty risk results are higher for more vulnerable categories, such as children and elderly people.

In Romania, child poverty reaches 31% in the base year, followed by Hungary, Bulgaria, Spain and Italy (above 25%). The lowest child poverty rates (below 12%) are observed in Slovenia, Czechia, Poland, Denmark and Finland (9%). Elderly poverty reaches 42% in Estonia, 41% in Latvia, 35% in Lithuania, and 32% in both Bulgaria and Malta. At the other end of the spectrum, the countries with the lowest elderly poverty rates (below 8%) are France, Denmark, Netherlands, Luxembourg and Slovakia. However, as we demonstrate in Section 4, in the case of Luxembourg and Netherlands there is a noticeable discrepancy between EUROMOD estimates and external information on elderly poverty rates which needs to be kept in mind when interpreting the results for these countries.

Table 1 also shows that over the period 2017 – 2020 changes in poverty rates due to changes in tax-benefit policies and income levels tend to be relatively small, though decreases in poverty rates were more prevalent than in previous years and increases, where they occurred, much less marked. Much of this relates to the effects of 2020 policy reforms, including those in response to Covid (see Section 2.5).

Still, increases in poverty rates greater than 1.5 percentage points were registered in Poland and Romania. In contrast, the country experiencing the largest poverty reduction due to changes in policy between 2017 and 2020 according to Table 1 is Lithuania where the poverty rate decreased by around 5.5 percentage points. This reduction in poverty rates is due almost entirely to changes made in 2020, in particular to increases in non means-tested benefits, public pensions, and means-tested benefits. Moreover, there were several packages of measures that came info force to counteract the Covid-19 pandemic. The only other country to see a poverty reduction greater than 1 percentage point due to changes in policy and income levels is Slovenia.

Table 1 also shows poverty trends due to changes in policy and income levels between 2017 and 2020 for different population subgroups (children and elderly people). Lithuania – see previous paragraph – is the country experiencing the strongest reduction in both child and elderly poverty (by around 11 and 8 percentage points respectively) in the period considered. Smaller falls (between 2-3 percentage points) in child poverty have been experienced in Greece and Estonia. Notable falls in elderly poverty of 3 percentage points or greater were recorded for Ireland and Czechia (as well as Lithuania, as just noted).

It should be emphasised that these figures are not expected to coincide with the value of social indicators produced by the EU-SILC for 2018 (based on 2017 incomes). The EUROMOD estimates show the movement in poverty and inequality indicators resulting from policy changes over the period 2017-2020, and from changes in average values of different income sources over the same period. For example, if benefits and tax thresholds were uprated in line with increases in (median) incomes generally we would expect to see no changes in the mentioned indicators. To the extent that they are not or that there is differential change across income sources or structural policy reforms, differences can be observed in the indicators. This is informative if, for example, poverty and inequality are generally growing or predicted to do so (meaning that things would be worse without the policy effect) or if poverty and inequality are falling fast (meaning that policy effects are not the sole explanation). It is useful to know the direction and relative size of the policy effect since it is this that policy makers can influence directly.

Table 1. EUROMOD poverty and inequality statistics: 2017-2020

	Policy year	Poverty risk			Poverty risk (60%)		Poverty threshold €/year	Gini
		50%	60%	70%	age <18	age>=65		
Belgium	2017	6.4	11.6	20.7	14.4	9.0	€ 13,545	0.223
	2018	6.7	11.7	21.4	14.5	9.6	€ 14,011	0.223
	2019	6.5	11.7	21.0	14.2	10.0	€ 14,454	0.222
	2020	5.9	11.4	20.4	13.5	10.1	€ 14,541	0.220
Bulgaria	2017	15.3	22.9	29.6	26.5	32.0	€ 2,225	0.392
	2018	15.3	22.9	30.2	25.5	34.0	€ 2,372	0.394
	2019	16.0	23.2	30.8	25.7	35.9	€ 2,569	0.399
	2020	15.1	23.2	30.6	25.8	35.9	€ 2,746	0.400
Czechia	2017	4.6	9.2	17.3	10.1	12.8	€ 5,387	0.232
	2018	4.9	9.6	17.7	10.5	13.6	€ 5,743	0.235
	2019	4.9	9.7	17.5	11.6	12.0	€ 6,227	0.235
	2020	4.4	8.4	15.6	10.5	8.2	€ 6,217	0.225
Denmark	2017	4.6	10.7	18.9	9.9	5.9	€ 17,886	0.247
	2018	5.1	10.9	19.1	10.0	6.0	€ 18,223	0.248
	2019	5.3	11.0	19.0	10.1	6.1	€ 18,506	0.249
	2020	5.3	11.2	19.6	9.9	6.7	€ 18,925	0.253
Germany	2017	8.0	14.3	22.5	12.8	16.8	€ 13,467	0.278
	2018	8.2	14.3	22.6	13.2	16.4	€ 13,810	0.278
	2019	8.3	14.5	22.6	13.9	16.3	€ 14,193	0.279
	2020	8.0	13.9	22.0	12.0	16.0	€ 14,500	0.275
Estonia	2017	11.6	21.2	29.5	16.6	42.0	€ 6,078	0.299
	2018	12.9	21.0	28.8	14.1	46.2	€ 6,848	0.289
	2019	12.3	20.7	28.9	14.2	44.5	€ 7,299	0.289
	2020	11.9	20.4	28.6	14.4	42.5	€ 7,653	0.289
Ireland	2017	7.9	17.5	26.9	20.2	26.1	€ 14,096	0.301
	2018	8.0	17.5	26.7	20.1	26.7	€ 14,471	0.304
	2019	7.9	17.9	26.7	19.9	30.0	€ 14,883	0.305
	2020	9.5	18.5	27.7	22.1	23.0	€ 15,196	0.308
Greece	2017	11.3	17.0	24.8	22.8	8.9	€ 4,925	0.306
	2018	10.7	16.6	24.0	20.9	10.1	€ 4,964	0.306
	2019	11.0	17.0	23.8	20.1	11.4	€ 5,200	0.307
	2020	11.9	17.8	25.0	19.9	14.7	€ 5,282	0.317
Spain	2017	14.3	21.1	28.9	26.2	14.0	€ 8,788	0.324
	2018	14.7	21.2	29.0	26.4	14.1	€ 8,873	0.324
	2019	14.2	21.0	28.7	26.3	13.6	€ 9,017	0.322
	2020	14.2	21.1	28.9	26.3	13.7	€ 9,110	0.315
France	2017	5.7	12.0	20.7	18.3	7.7	€ 13,170	0.267
	2018	5.7	12.1	20.7	18.4	7.9	€ 13,458	0.270
	2019	6.2	12.7	21.7	18.8	9.3	€ 14,053	0.273
	2020	6.2	12.9	22.0	18.8	10.1	€ 14,386	0.272
Italy	2017	13.8	20.0	27.9	25.8	13.4	€ 9,681	0.331
	2018	13.9	21.1	28.1	25.8	13.6	€ 9,840	0.331
	2019	13.7	21.1	28.1	26.1	13.6	€ 9,911	0.328
	2020	13.3	19.8	28.3	25.7	14.0	€ 10,048	0.324

	Policy year	Poverty risk			Poverty risk (60%)		Poverty threshold	Gini
		50%	60%	70%	age <18	age>=65	€/year	
Cyprus	2017	7.2	16.4	25.8	20.6	23.6	€ 9,464	0.293
	2018	7.6	16.8	26.1	20.8	25.3	€ 9,667	0.294
	2019	7.1	16.1	26.2	20.4	22.3	€ 9,624	0.294
	2020	6.0	15.5	25.6	19.8	20.8	€ 9,438	0.293
Latvia	2017	15.6	22.3	30.1	17.3	41.4	€ 4,127	0.349
	2018	15.7	22.7	29.9	17.2	43.7	€ 4,494	0.347
	2019	15.9	22.9	30.0	17.6	43.9	€ 4,831	0.347
	2020	15.7	22.7	29.7	17.8	42.9	€ 5,162	0.344
Lithuania	2017	15.1	21.9	29.1	22.8	35.0	€ 3,977	0.359
	2018	13.7	21.1	28.8	20.4	35.2	€ 4,464	0.349
	2019	13.5	21.0	28.9	19.8	34.8	€ 4,939	0.341
	2020	9.5	16.5	25.0	11.5	27.0	€ 5,108	0.317
Luxembourg	2017	1.7	10.9	22.8	13.6	5.0	€ 21,571	0.253
	2018	1.7	10.5	22.3	12.8	5.0	€ 21,576	0.253
	2019	1.7	11.0	22.7	13.7	5.0	€ 22,129	0.253
	2020	1.4	11.5	22.6	12.2	7.5	€ 22,652	0.253
Hungary	2017	16.8	22.4	28.9	28.3	18.7	€ 3,044	0.318
	2018	16.7	22.7	29.0	28.4	20.0	€ 3,127	0.319
	2019	16.7	22.8	29.4	29.1	20.8	€ 3,447	0.321
	2020	16.4	22.6	29.1	28.4	20.8	€ 3,127	0.320
Croatia	2017	13.6	19.5	26.1	19.2	29.0	€ 4,098	0.289
	2018	13.6	19.5	26.2	18.9	29.4	€ 4,290	0.289
	2019	14.0	19.8	26.5	19.4	29.7	€ 4,475	0.288
	2020	14.1	19.8	26.1	19.4	29.7	€ 4,476	0.291
Malta	2017	7.6	16.8	25.0	15.7	32.3	€ 9,079	0.282
	2018	8.2	17.3	25.2	16.2	34.0	€ 9,413	0.284
	2019	8.2	17.4	25.2	16.3	34.4	€ 9,749	0.285
	2020	7.1	15.9	24.5	15.4	29.9	€ 9,725	0.279
Netherlands	2017	5.7	11.6	20.0	13.5	5.6	€ 14,206	0.260
	2018	5.7	11.5	19.8	13.4	5.1	€ 14,351	0.260
	2019	5.7	11.6	19.9	13.5	5.3	€ 14,830	0.259
	2020	5.8	11.5	19.9	13.6	4.9	€ 15,126	0.257
Austria	2017	6.1	14.6	22.1	18.4	13.5	€ 14,752	0.251
	2018	6.0	14.5	22.4	18.3	13.4	€ 15,054	0.251
	2019	6.5	14.8	22.1	18.4	14.3	€ 15,603	0.248
	2020	6.1	14.2	21.8	16.7	14.1	€ 16,203	0.244
Poland	2017	8.4	14.0	21.8	10.0	15.4	€ 3,932	0.269
	2018	8.6	14.6	22.3	10.5	17.3	€ 3,967	0.274
	2019	8.6	14.8	22.6	11.5	16.7	€ 4,317	0.276
	2020	9.5	15.8	23.8	12.2	20.3	€ 4,606	0.278
Portugal	2017	9.5	16.2	24.8	17.3	16.9	€ 5,745	0.314
	2018	9.6	16.5	25.0	17.6	17.7	€ 5,902	0.315
	2019	9.5	16.4	24.7	16.9	18.0	€ 6,017	0.315
	2020	9.5	16.7	25.0	17.0	19.1	€ 6,109	0.315
Romania	2017	17.0	23.5	31.0	31.4	23.3	€ 2,052	0.332
	2018	17.8	24.5	31.6	32.9	24.4	€ 2,217	0.340

	Policy year	Poverty risk 50%	Poverty risk 60%	Poverty risk 70%	Poverty risk (60%) age <18	Poverty risk (60%) age>=65	Poverty threshold €/year	Gini
	2019	17.1	23.4	31.3	29.8	24.2	€ 2,428	0.337
	2020	18.1	25.0	31.4	34.1	23.2	€ 2,576	0.344
Slovenia	2017	7.2	13.5	21.0	11.8	17.6	€ 7,694	0.236
	2018	4.2	11.9	20.6	9.0	16.6	€ 7,947	0.231
	2019	4.5	12.5	20.8	10.2	17.1	€ 8,223	0.233
	2020	4.4	12.2	20.7	9.8	15.8	€ 8,306	0.233
Slovakia	2017	6.4	10.7	17.3	17.5	4.8	€ 4,466	0.203
	2018	6.4	11.2	17.8	18.0	5.9	€ 4,704	0.205
	2019	6.4	11.3	18.2	17.8	6.4	€ 5,005	0.207
	2020	6.5	11.0	18.0	17.1	6.2	€ 5,219	0.204
Finland	2017	3.3	10.4	18.9	9.5	10.8	€ 14,525	0.239
	2018	3.4	10.3	18.9	9.3	11.2	€ 14,657	0.240
	2019	3.5	10.3	19.0	9.4	11.5	€ 14,910	0.241
	2020	3.4	10.2	18.7	9.3	11.2	€ 15,159	0.240
Sweden	2017	8.3	15.2	24.0	17.9	10.0	€ 15,223	0.258
	2018	8.2	14.7	23.4	17.8	10.6	€ 14,617	0.254
	2019	8.9	15.4	23.7	18.5	12.5	€ 15,094	0.257
	2020	8.9	14.8	23.6	18.5	9.6	€ 15,704	0.257
United Kingdom	2017	8.0	15.1	23.9	18.5	17.7	€ 12,181	0.296
	2018	8.3	15.1	24.4	18.7	17.2	€ 12,345	0.308
	2019	8.8	16.1	24.8	20.7	17.6	€ 12,549	0.312
	2020	8.4	14.7	23.7	18.5	17.2	€ 12,514	0.305

Source: EUROMOD version I3.0+
Note: EUROMOD figures for 2017-2020 for all countries, except for the UK, are based on SILC 2018 (2017 incomes). For the UK, results are based on FRS 2017/18.

3.2. The effect of taxes and benefits on the risk of poverty

Figure 1 shows that the effect of adding public pensions to market income reduces poverty before taxes and benefits significantly in all countries. In the base year 2017, public pensions show the largest anti-poverty effect among various instruments of EU tax-benefits systems. Table 2 shows that in Greece, when added to market incomes, pensions contribute to reducing the poverty rate by 26 percentage points, the largest effect across countries. Other countries where public pensions play a major role in reducing poverty (a reduction greater than 20 percentage points) are Belgium, France, Italy, Poland and Portugal. On the contrary, the countries where public pensions are less effective in reducing poverty when added to original incomes are United Kingdom, Netherlands and Ireland. In these countries in fact an important part of the pensions system consists of occupational and private pensions (included in original income), while public pensions have the role of a residual safety net.

After public pensions, means-tested benefits represent another important instrument for poverty reduction, in particular in United Kingdom, Ireland and, to a lesser extent, Netherlands, Denmark, Finland and France. In these countries, when means-tested benefits are subtracted from disposable income, the poverty rate increases between around 7 and 12 percentage points. On the other hand, in many countries, the anti-poverty effect of means-tested benefits remains modest. In fact, in 10 countries the increase is below 3 percentage points; and for Estonia and Latvia, the anti-poverty effect of means-tested benefits is very close to zero.

In addition, in several countries an important anti-poverty role is played by universal benefits or benefits not subject to a means-test (e.g. unemployment benefits). This is the case for Luxembourg, Finland, Sweden, United Kingdom and Austria: in these countries, when non-means tested benefits are subtracted from disposable income, the poverty rate increases between 7 and 10 percentage points. On the other hand, the anti-poverty effect of non-means-tested benefits in the base year remains very modest in Greece – a little under 1 percentage point only.

Adding back taxes to disposable income has a relatively small poverty-reducing effect. Larger effects are observed in the Nordic countries, where the tax system has a more marked redistributive role: in fact, in Denmark and Sweden the poverty-reducing effect of adding taxes back to the disposable income is 7.0 and 5.4 percentage points respectively. Other countries experiencing a noticeable effect above 3 percentage points are Hungary (6.7), Poland (4.4), Finland (3.9), United Kingdom (3.4) and Latvia (3.0). On the other hand, for 12 EU countries, the poverty-reducing effect remains below 1 percentage point.

Regarding the poverty-reducing effect of adding back social insurance contributions (SIC) to disposable income, we observe similar magnitudes as for taxes. The strongest poverty-reducing effects are observed in Hungary, Poland, Luxembourg, Slovenia and Slovakia (around 4-5 percentage points). On the other hand, SICs have a very minor poverty-reducing effect (less than 1 percentage point) in Estonia, Ireland and Denmark.

Table 2 offers also a comparison of how the impact of different components of the tax/benefits systems on poverty changed between 2017 and 2020. In general, the rankings of the countries, in terms of the anti-poverty effectiveness of the single tax/benefits instruments, are largely preserved.

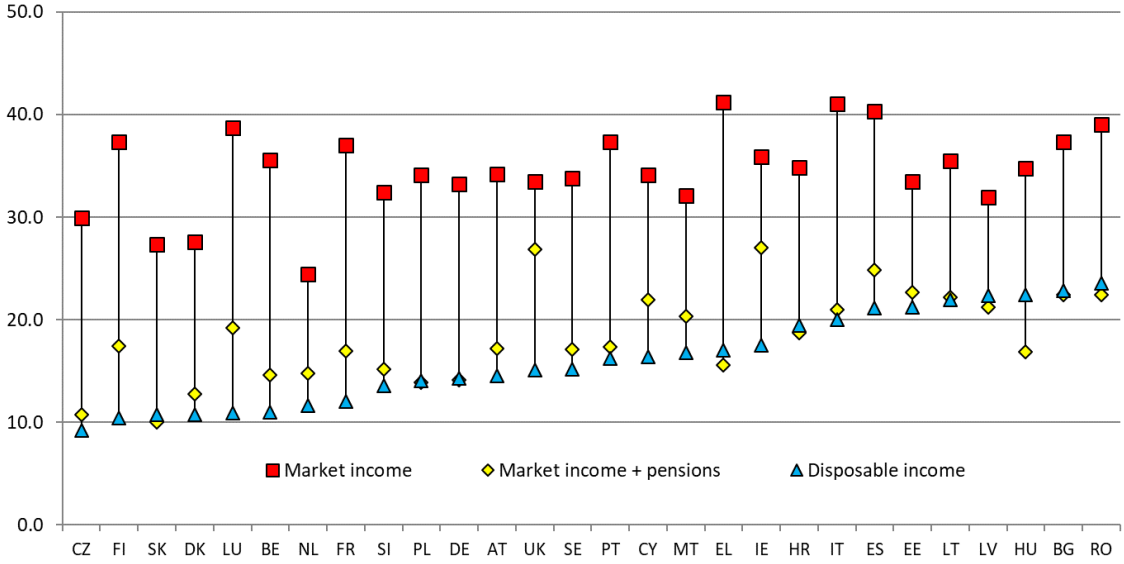
With respect to means-tested benefits, whilst for most countries the performance of means-tested benefits remains basically unchanged (between -1 and 1 percentage points), we observe a decline in anti-poverty effectiveness in Poland (a decrease in the poverty-reducing effect of 4.3 percentage points). In contrast, for Lithuania we see an increase in anti-poverty effectiveness (2.8 percentage points over the period). For Poland, this large decrease is more than offset by a larger increase in the poverty-reducing effect of non-means-tested benefits (see immediately below) due primarily to childcare allowance being reclassified in 2020 from means to non-means tested benefits, thereby expanding its effectiveness.

As far as non-means-tested benefits are concerned, again, at the EU level we do not observe large differences in their anti-poverty impact between 2017 and 2020. The effect for most countries stays between -1 and 1 percentage points. There are, however, two exceptions and they are again Lithuania and Poland (as just noted). This time we observe large increases in the anti-poverty effectiveness of non-means-tested benefits for both countries (5.0 and 6.3 percentage points respectively).

As far as taxes are concerned, between 2017 and 2020 we observe even less variation in the poverty-reducing effect of adding taxes back to disposable income. Again, the effect for almost all countries stays in the range -1 to 1 percentage points. Similar findings apply to Social Insurance Contributions with the effect size for all but two of the countries remaining between -1 and 1 percentage points. For both taxes and SICs, exceptions fall only just outside the -1 to 1 percentage point range.

Finally, when looking at how the anti-poverty effects of public pensions have changed over time, while for most countries we do not observe any substantial change, we see a decline in the poverty-reduction effect of between 1 and 3 percentage points in Bulgaria and Poland. The opposite is true for Czechia, where the increase in anti-poverty effectiveness of public pensions is 1.3 percentage points.

Figure 1. Poverty risk and the role of public pensions and non-pension benefits and taxes (2017 incomes and policies)



Source: EUROMOD version I3.0+
Note: Countries have been ranked according to the poverty estimates for disposable income. EUROMOD figures for all countries, except for the UK, are based on SILC 2018 (2017 incomes). For the UK, results are based on FRS 2017/18.

Table 2. Effects of tax-benefit components on poverty risk: 2017-2020

	Policy year	Disposable income (DPI)	DPI less means-tested benefits	DPI less non means-tested benefits	DPI plus direct Taxes	DPI plus Social Insurance Contrib.	Original Income	Original Income plus pensions
Belgium	2017	11.6	15.9	15.3	11.1	10.3	35.4	14.5
	2018	11.7	16.0	15.6	11.5	10.7	35.7	14.7
	2019	11.7	16.1	15.5	11.6	10.3	35.7	14.8
	2020	11.4	15.8	15.3	11.3	10.0	35.8	14.8
Bulgaria	2017	22.9	24.5	25.9	20.9	19.8	37.4	22.5
	2018	22.9	24.8	26.2	21.1	19.8	37.3	22.9
	2019	23.2	25.0	26.3	21.6	20.2	36.8	23.1
	2020	23.2	25.0	26.3	21.5	20.4	36.5	22.9
Czechia	2017	9.2	11.0	11.9	8.9	7.2	29.9	10.7
	2018	9.6	11.3	12.3	9.2	7.6	29.9	10.9
	2019	9.7	11.2	12.5	9.2	7.5	30.0	10.6
	2020	8.4	9.6	11.4	7.8	6.7	30.5	10.1
Denmark	2017	10.7	17.9	17.5	3.7	10.4	27.6	12.7
	2018	10.9	17.9	17.5	3.8	10.5	27.6	12.7
	2019	11.0	17.9	17.5	3.9	10.6	27.6	12.7
	2020	11.2	17.9	17.8	3.9	10.8	27.7	12.7
Germany	2017	14.3	16.5	19.8	13.0	11.3	33.2	14.1
	2018	14.3	16.3	19.8	13.0	11.2	33.3	14.1
	2019	14.5	16.3	19.9	13.1	11.3	33.2	14.0
	2020	13.9	16.1	19.9	12.7	11.2	33.4	14.0
Estonia	2017	21.2	21.3	27.6	18.7	20.5	33.5	22.6
	2018	21.0	21.0	27.8	20.0	20.5	34.7	24.7

	Policy year	Disposable income (DPI)	DPI less means-tested benefits	DPI less non means-tested benefits	DPI plus direct taxes	DPI plus Social Insurance Contrib.	Original Income	Original Income plus pensions
	2019	20.7	20.7	27.6	19.6	20.1	34.6	24.2
	2020	20.4	20.4	27.1	19.0	19.7	34.5	23.5
Ireland	2017	17.5	25.8	22.9	17.1	17.2	35.9	27.1
	2018	17.5	25.6	22.7	17.0	17.1	35.8	26.9
	2019	17.9	25.4	22.5	17.0	17.6	35.4	26.8
	2020	18.5	26.0	23.3	17.7	18.1	35.6	26.8
Greece	2017	17.0	21.7	17.8	14.6	13.8	41.2	15.6
	2018	16.6	21.5	17.4	14.0	13.5	40.9	15.2
	2019	17.0	21.0	17.7	14.5	13.9	40.9	15.1
	2020	17.8	21.6	18.7	15.9	14.8	41.2	16.2
Spain	2017	21.1	25.6	24.0	20.6	18.3	40.3	24.8
	2018	21.2	25.7	24.1	20.6	18.4	40.3	24.8
	2019	21.0	25.9	23.8	20.5	17.9	40.3	24.7
	2020	21.1	26.0	23.9	20.4	17.9	40.3	24.8
France	2017	12.0	18.7	18.3	9.7	8.7	37.0	17.0
	2018	12.1	18.8	18.2	9.6	9.2	36.8	17.1
	2019	12.7	19.0	18.5	10.0	10.0	37.3	17.6
	2020	12.9	19.1	18.6	10.1	10.1	37.3	17.8
Italy	2017	20.0	23.2	23.0	18.3	17.4	41.0	21.0
	2018	20.1	23.3	23.0	18.3	17.4	40.9	21.0
	2019	20.1	23.3	23.1	18.4	17.4	40.8	20.9
	2020	19.8	23.0	23.5	18.2	17.3	40.9	21.1
Cyprus	2017	16.4	21.8	19.7	16.2	13.8	34.2	21.9
	2018	16.8	22.0	20.0	16.6	14.3	33.9	21.9
	2019	16.1	22.2	19.5	15.9	13.1	33.0	21.0
	2020	15.5	21.9	19.0	15.3	12.4	32.9	20.7
Latvia	2017	22.3	22.4	26.7	19.3	20.2	32.0	21.2
	2018	22.7	22.7	27.1	20.0	20.5	32.2	22.1
	2019	22.9	22.9	27.0	20.3	20.8	32.3	22.2
	2020	22.7	22.7	26.6	20.4	20.5	32.4	22.1
Lithuania	2017	21.9	22.4	25.6	21.2	20.4	35.5	22.2
	2018	21.1	22.3	26.5	20.1	19.2	36.1	22.8
	2019	21.0	22.0	27.5	18.8	17.0	32.4	20.2
	2020	16.5	19.8	25.1	15.1	13.5	33.4	19.3
Luxembourg	2017	10.9	16.6	20.7	10.5	5.9	38.7	19.2
	2018	10.5	16.6	20.3	9.8	5.8	38.7	19.2
	2019	11.0	16.6	20.7	9.9	5.9	38.5	19.0
	2020	11.5	16.6	21.7	10.3	5.4	38.1	18.7
Hungary	2017	22.4	23.0	26.5	15.7	17.3	34.8	16.9
	2018	22.7	23.5	26.4	16.1	17.5	34.5	17.0
	2019	22.8	23.5	26.0	16.5	17.7	34.2	17.1
	2020	22.6	23.3	25.9	16.4	17.3	34.2	17.1
Croatia	2017	19.5	21.1	21.3	19.3	16.4	34.8	18.7
	2018	19.5	21.0	21.5	19.3	16.6	34.7	18.8
	2019	19.8	21.3	21.5	19.6	16.8	34.8	19.0
	2020	19.8	21.2	21.5	19.6	16.8	34.9	18.9

	Policy year	Disposable income (DPI)	DPI less means-tested benefits	DPI less non means-tested benefits	DPI plus direct taxes	DPI plus Social Insurance Contrib.	Original Income	Original Income plus pensions
Malta	2017	16.8	21.3	19.7	15.9	14.6	32.1	20.3
	2018	17.3	21.5	20.1	16.5	15.0	31.8	20.3
	2019	17.4	21.7	20.1	16.5	14.8	31.4	20.1
	2020	15.9	21.0	19.0	15.1	13.6	32.0	19.7
Netherlands	2017	11.6	19.2	18.0	9.8	8.3	24.4	14.8
	2018	11.5	19.3	17.9	9.6	8.1	24.5	14.8
	2019	11.6	19.4	18.1	10.0	8.3	24.8	15.0
	2020	11.5	19.5	18.0	9.8	8.4	25.5	15.4
Austria	2017	14.6	17.9	21.9	13.7	11.0	34.2	17.2
	2018	14.5	18.0	22.1	13.6	10.8	34.0	17.1
	2019	14.8	17.7	21.6	14.5	11.3	34.3	17.4
	2020	14.2	17.4	21.4	14.5	10.8	34.9	18.0
Poland	2017	14.0	20.9	16.2	9.6	10.2	34.1	13.9
	2018	14.6	21.0	16.8	10.3	10.7	33.3	14.1
	2019	14.8	20.8	18.4	10.3	11.0	32.7	14.7
	2020	15.8	18.3	24.3	11.5	12.2	34.3	16.9
Portugal	2017	16.2	18.9	18.4	15.1	14.2	37.4	17.3
	2018	16.5	19.0	18.6	15.3	14.4	37.4	17.5
	2019	16.4	19.3	18.5	15.4	14.1	37.4	17.5
	2020	16.7	19.5	18.9	15.6	14.3	37.4	17.7
Romania	2017	23.5	25.4	26.2	20.8	20.1	39.0	22.5
	2018	24.5	25.9	27.1	23.0	19.0	35.5	20.5
	2019	23.4	25.3	27.7	21.6	18.7	35.5	20.6
	2020	25.0	26.3	28.5	23.0	19.7	36.8	21.1
Slovenia	2017	13.5	16.6	19.7	12.9	9.4	32.4	15.2
	2018	11.9	16.5	18.8	11.0	7.7	32.4	14.9
	2019	12.5	16.4	19.3	11.6	8.0	32.2	14.9
	2020	12.2	16.6	19.2	11.2	7.7	32.8	15.0
Slovakia	2017	10.7	12.1	15.0	10.0	7.0	27.3	10.0
	2018	11.2	12.4	15.2	10.3	7.2	27.3	10.1
	2019	11.3	12.5	14.8	10.3	7.4	27.1	10.2
	2020	11.0	12.4	15.1	10.4	7.1	27.4	10.3
Finland	2017	10.4	17.2	19.5	6.5	9.4	37.3	17.4
	2018	10.3	17.3	19.4	6.4	9.3	37.0	17.3
	2019	10.3	17.3	19.3	6.6	9.4	36.9	17.2
	2020	10.2	17.2	19.2	6.5	9.2	36.8	17.2
Sweden	2017	15.2	18.5	24.2	9.8	13.4	33.8	17.1
	2018	14.7	18.2	23.7	10.1	13.1	34.1	17.5
	2019	15.4	18.4	24.1	10.7	13.8	34.2	17.7
	2020	14.8	18.5	23.6	10.7	13.4	34.3	17.7
United Kingdom	2017	15.1	26.7	23.4	11.7	13.9	33.4	26.9
	2018	15.1	26.4	23.3	11.6	13.8	32.5	26.3
	2019	16.1	26.5	23.7	12.3	14.7	32.5	26.2
	2020	14.7	26.7	22.4	11.4	13.6	32.9	26.5

Source: EUROMOD version I3.0+
Note: EUROMOD figures for 2017-2020 for all countries, except for the UK, are based on SILC 2018 (2017 incomes). For the UK, results are based on FRS 2017/18.

3.3. The effect of taxes and benefits on the poverty gap

Table 3 shows the effects of tax/benefits instruments on the poverty gap, which measures the average distance between the disposable income of the poor and the poverty line (as % of the poverty line). The table shows that the countries with the highest poverty rates are also in general the countries with the highest poverty gap in the base year. The poverty gap reaches 33% in Romania and also reaches or exceeds 26% in each of Bulgaria, Greece, Spain, Hungary, Italy and Lithuania and Latvia. The countries with the lowest poverty gap in the base year are Finland (11%), and Luxembourg (8%). Comparing the 2020 results with the base year, we do not observe substantial differences or re-rankings, save for Italy, Lithuania and Slovenia where the poverty gap closes fairly substantially over the four years.

Table 3 also enables us to decompose the effects of taxes and benefits on the poverty gap using the same approach followed in Table 2. Public pensions lower the poverty gap on average by 48 percentage points when added to market incomes in the base year (2017). This effect varies widely across countries, however, almost reaching 80 percentage points in Czechia and reaching or exceeding 60 in Greece, Croatia, Portugal, Slovenia and Slovakia. On the other hand very small effects can be found in United Kingdom, Denmark and Netherlands.

On average, means-tested benefits represent the second most important instrument, after public pensions, in terms of effectiveness at reducing the poverty gap. On average they help in closing the poverty gap by 10 percentage points, and up to 33 percentage points in Ireland. On the other hand, they have very modest effects (below 2.5 percentage points) in Hungary, Estonia, Lithuania and Latvia. Non-means tested benefits have a smaller impact on average, helping to close the gap by around 5 percentage points. The poverty gap reduction effect is strongest in Denmark (19 percentage points), while only modest effects (below 1 percentage point) can be found in Poland and Romania. The poverty gap estimates are not significantly affected by the addition of taxes and social insurance contributions.

When we look at how the effectiveness of tax/benefits instruments at closing the poverty gap has changed over time, we cannot observe substantial changes between 2017 and 2020. The few exceptions are represented by a stronger effectiveness of means-tested benefits in Slovenia and Italy, with the effect moving in the opposite direction for Hungary, Ireland and Poland. On the other hand, there is a stronger positive effect for non-means-tested benefits for Poland.

Table 3. Effects of tax-benefit components on poverty gap: 2017-2020

	Policy year	Disposable income (DPI)	DPI less means-tested benefits	DPI less non means-tested benefits	DPI plus direct taxes	DPI plus Social Insurance Contrib.	Original Income	Original Income plus pensions
Belgium	2017	19.3	28.2	30.6	20.7	20.4	99.9	52.1
	2018	19.0	27.9	28.8	21.5	19.1	99.8	50.9
	2019	18.3	28.2	29.3	20.5	19.2	99.9	50.6
	2020	16.9	28.2	29.5	19.1	19.1	99.9	50.7
Bulgaria	2017	26.2	31.4	27.6	26.1	26.6	77.0	34.1
	2018	26.0	31.0	27.2	25.7	25.9	77.7	33.8
	2019	26.8	30.7	27.6	26.1	26.2	79.3	32.9
	2020	26.4	30.4	27.0	25.7	25.8	79.4	32.6
Czechia	2017	16.6	20.0	18.2	16.6	14.8	100.0	20.3
	2018	17.4	20.4	18.2	17.7	14.7	100.0	20.2
	2019	17.3	21.2	18.5	18.1	15.6	100.0	20.5
	2020	18.1	22.4	19.4	18.6	15.9	99.7	22.4
Denmark	2017	15.0	30.9	34.4	24.3	15.2	74.9	65.0
	2018	15.2	30.8	35.0	24.9	15.7	74.9	65.0
	2019	15.8	31.2	35.5	24.7	16.3	74.9	64.9
	2020	15.9	30.6	34.4	25.2	16.5	74.7	63.7
Germany	2017	19.3	30.4	24.0	21.0	22.3	96.6	40.6
	2018	20.1	30.8	24.4	21.6	22.7	96.5	40.1
	2019	20.0	31.0	24.5	21.9	23.0	96.8	40.4
	2020	20.4	30.9	24.1	21.6	22.1	96.6	40.5
Estonia	2017	18.1	20.4	24.0	18.5	17.6	83.8	24.5
	2018	21.1	22.3	24.5	21.3	20.9	82.0	25.7
	2019	20.5	21.6	24.4	20.8	20.5	82.8	25.2
	2020	19.2	20.4	24.0	19.9	19.4	83.2	24.5
Ireland	2017	13.6	46.1	18.5	13.3	13.8	91.7	51.0
	2018	13.5	46.0	18.5	13.2	13.9	91.5	51.1
	2019	12.6	47.1	18.8	13.0	12.8	91.5	51.3
	2020	17.7	45.1	21.1	17.5	17.9	92.1	51.5
Greece	2017	25.7	31.6	26.8	24.0	23.0	97.6	32.2
	2018	24.1	31.8	25.4	22.7	22.0	98.8	32.1
	2019	24.9	31.6	26.0	24.2	22.5	98.9	32.6
	2020	25.9	31.6	27.1	25.1	23.1	98.5	31.0
Spain	2017	28.4	36.7	32.3	29.0	27.7	74.1	38.2
	2018	28.7	36.5	32.6	29.3	27.8	74.2	38.2
	2019	28.4	36.6	32.7	28.7	27.6	74.8	38.4
	2020	28.5	36.6	31.7	28.9	25.9	75.2	38.4
France	2017	15.2	30.7	21.4	16.9	17.8	78.4	39.2
	2018	15.5	30.1	21.5	17.2	17.3	79.2	38.8
	2019	16.0	30.3	22.0	18.9	18.4	78.5	38.4
	2020	15.6	30.3	21.8	18.6	17.9	78.7	38.5
Italy	2017	32.2	35.3	35.0	34.2	32.4	81.8	38.8
	2018	31.7	34.4	34.4	33.9	32.2	80.4	38.2
	2019	29.8	34.4	32.0	31.5	29.2	80.5	38.1
	2020	27.4	34.2	30.6	28.9	27.0	80.5	38.4

	Policy year	Disposable income (DPI)	DPI less means-tested benefits	DPI less non means-tested benefits	DPI plus direct taxes	DPI plus Social Insurance Contrib.	Original Income	Original Income plus pensions
Cyprus	2017	14.7	24.5	17.8	14.7	14.9	67.6	28.3
	2018	15.0	24.9	18.2	15.1	15.3	68.2	29.1
	2018	14.8	25.2	17.9	14.8	15.1	70.3	28.6
	2020	13.6	24.7	15.4	13.5	12.7	71.3	28.2
Latvia	2017	26.8	26.9	29.4	27.6	27.2	90.3	32.3
	2018	26.9	27.2	30.6	28.2	27.7	90.1	32.5
	2019	26.9	27.3	30.6	28.4	27.4	89.4	32.7
	2020	26.5	27.0	30.5	28.4	27.9	89.0	32.5
Lithuania	2017	27.0	29.5	29.7	27.1	26.3	91.2	31.9
	2018	24.1	27.5	29.5	24.4	24.1	90.7	32.0
	2019	23.1	26.8	29.3	23.7	24.3	96.7	32.1
	2020	21.0	24.4	26.1	21.4	21.8	95.1	31.6
Luxembourg	2017	8.1	27.3	18.8	9.2	7.4	81.5	38.1
	2018	8.2	27.4	17.8	9.5	7.4	81.3	38.1
	2019	8.2	27.4	17.5	9.3	7.7	81.3	39.1
	2020	6.6	28.2	15.6	7.3	8.4	82.2	39.2
Hungary	2017	30.6	32.7	37.4	29.7	33.4	86.4	42.4
	2018	31.3	32.1	37.5	30.1	33.8	86.3	43.4
	2019	32.1	32.4	37.6	31.2	34.6	86.2	43.4
	2020	31.7	32.2	37.3	31.5	35.9	86.2	43.4
Croatia	2017	27.8	32.4	29.4	27.6	27.0	98.9	34.1
	2018	27.4	32.3	29.5	27.4	27.4	99.1	33.8
	2019	28.0	32.6	30.0	28.0	27.6	98.9	33.9
	2020	27.8	32.4	29.9	27.9	27.6	98.9	34.1
Malta	2017	14.9	23.1	18.0	15.7	15.5	81.9	25.2
	2018	15.4	22.9	17.9	16.2	15.5	82.5	25.3
	2019	15.4	22.8	18.0	15.9	15.9	83.0	25.3
	2020	14.8	22.2	17.6	15.2	14.9	82.5	25.3
Netherlands	2017	16.1	34.5	27.0	17.8	17.5	61.5	60.5
	2018	16.5	34.6	27.2	18.4	18.9	61.4	60.3
	2019	16.2	34.7	26.9	17.3	18.3	61.6	59.7
	2020	16.9	34.7	26.6	19.0	17.2	60.2	58.8
Austria	2017	13.8	23.8	22.7	15.4	12.6	95.8	39.6
	2018	13.6	23.3	21.8	15.2	12.8	95.9	39.8
	2019	13.9	24.3	22.4	16.8	13.4	95.8	39.8
	2020	13.6	23.9	22.7	15.8	12.9	95.0	39.7
Poland	2017	22.0	28.0	22.2	23.5	20.4	81.0	29.3
	2018	21.6	27.4	21.8	23.2	21.1	83.7	29.3
	2019	21.4	27.3	22.4	23.3	20.6	86.4	29.4
	2020	22.0	23.9	25.9	23.6	22.0	81.9	29.4
Portugal	2017	21.3	26.4	24.6	22.5	20.6	89.2	28.8
	2018	21.2	26.6	24.5	22.1	20.5	89.2	28.6
	2019	21.1	26.4	24.1	22.1	20.6	89.2	28.5
	2020	20.7	26.4	24.2	21.8	20.7	89.4	28.4
Romania	2017	33.2	37.0	33.6	33.4	36.4	100.0	44.4
	2018	34.6	37.8	36.0	35.5	42.8	100.0	54.3

	Policy year	Disposable income (DPI)	DPI less means-tested benefits	DPI less non means-tested benefits	DPI plus direct taxes	DPI plus Social Insurance Contrib.	Original Income	Original Income plus pensions
	2019	33.8	38.0	34.1	33.2	39.7	100.0	53.9
	2020	33.3	36.6	34.5	33.0	42.4	100.0	55.8
Slovenia	2017	17.9	25.7	22.1	18.2	17.9	90.6	26.7
	2018	13.0	25.4	17.2	12.6	14.6	90.5	26.7
	2019	13.4	25.3	18.1	13.3	15.3	90.5	26.5
	2020	13.0	25.9	18.0	12.4	14.5	90.6	27.4
Slovakia	2017	21.4	26.1	26.4	23.0	23.4	97.3	35.3
	2018	21.8	26.6	27.2	23.4	24.5	97.3	34.6
	2019	21.6	26.1	27.9	24.0	25.3	98.5	34.0
	2020	22.9	26.6	27.7	24.4	27.0	97.4	35.1
Finland	2017	11.1	26.5	21.3	11.8	11.8	91.6	43.0
	2018	11.5	26.4	21.3	11.7	11.6	92.0	43.5
	2019	11.6	26.4	21.5	11.6	11.9	92.2	43.9
	2020	11.4	26.8	21.8	11.8	12.0	92.4	42.7
Sweden	2017	19.1	28.2	34.8	21.3	18.2	86.5	52.6
	2018	19.8	27.8	36.1	21.2	18.7	86.3	52.1
	2019	20.2	28.3	36.3	21.4	18.3	86.4	52.3
	2020	21.1	28.2	36.7	21.9	19.6	86.7	52.2
United Kingdom	2017	17.9	40.2	21.1	16.6	18.5	67.3	49.7
	2018	18.7	40.7	21.7	17.6	19.5	68.3	51.8
	2019	18.9	41.3	22.5	17.3	19.4	68.2	52.0
	2020	19.0	41.1	21.6	17.8	19.7	68.4	51.6

Source: EUROMOD version I3.0+
Note: EUROMOD figures for 2017-2020 for all countries, except for the UK, are based on SILC 2018 (2017 incomes). For the UK, results are based on FRS 2017/18.

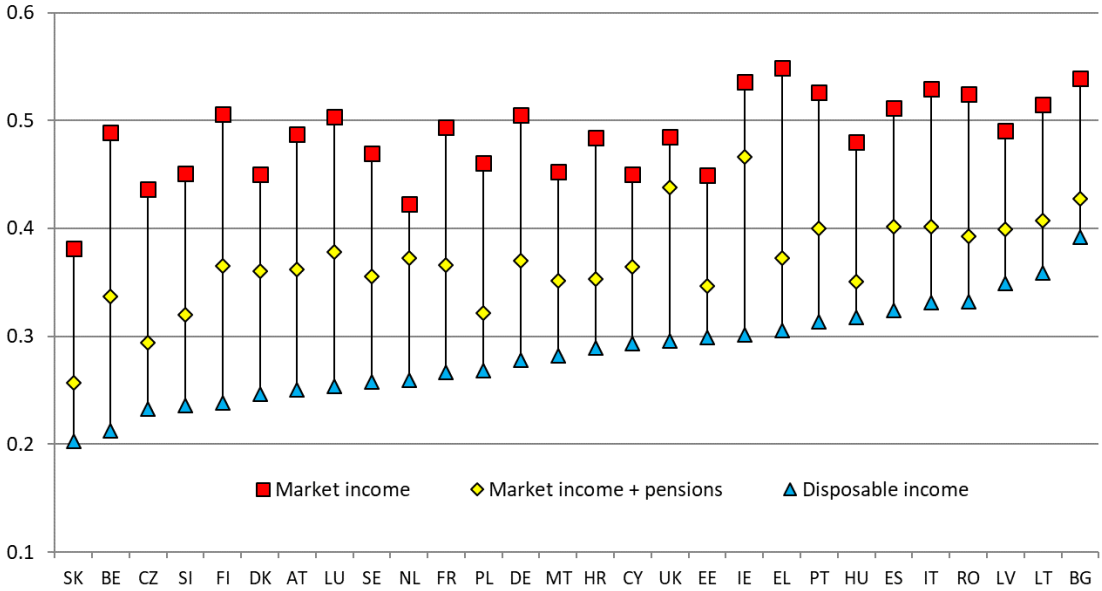
3.4. The effect of taxes and benefits on inequality

Table 4 and Figure 2 show the role of tax-benefit components of household income in reducing income inequality as measured by the Gini coefficient. Inequality of market income including public pensions (before tax) is everywhere lower than inequality of market income but higher than that of disposable income.

As in the case of poverty, public pensions are the most significant income component in reducing inequality in market incomes. The countries experiencing the largest reduction in the Gini coefficient once public pensions are added to original income are Greece (the Gini drops by over 0.17 percentage points), followed by Belgium, Czechia, Germany, Finland, Croatia, Hungary, Poland, Portugal and Slovenia (0.13-0.15 percentage points). At the other extreme of the spectrum, in Netherlands and United Kingdom the Gini coefficient drops only by around 0.05 percentage points, given the greater importance of private and occupational pensions (included here in market income) in these countries, in addition to publicly provided old age pensions.

Non-pension benefits and taxes (income taxes and social contributions) vary in their effectiveness in reducing income inequality across countries. They have a relatively large role compared with other countries in Belgium and Luxembourg (taxes), Ireland (means-tested benefits and taxes), and United Kingdom (means-tested benefits).

Figure 2. Income inequality (Gini coefficient) and the role of public pensions and non-pension benefits and taxes (2017 incomes and policies)



Source: EUROMOD version I3.0+

Note: Countries have been ranked according to the value of the Gini coefficient for disposable income. EUROMOD figures for all countries, except for the UK, are based on SILC 2018 (2017 incomes). For the UK, results are based on FRS 2017/18.

After pensions, means-tested benefits are on average the second instrument in order of importance to reduce inequality. The largest effect of means-tested benefits on the Gini coefficient can be found by in Ireland and United Kingdom - where the Gini increases by around 0.07 percentage points when means-tested benefits are removed from disposable income. The other countries where means-tested benefits have a large effect on the Gini are Netherlands, Denmark and Finland (between 0.04 and 0.05 percentage points). On the other hand, the countries where means-tested benefits have the smallest inequality reducing effect are Hungary, Estonia, Lithuania and Latvia. In these countries, the increase in the Gini index is no more than 0.01 percentage point when means-tested benefits are subtracted from disposable income. This ranking can be explained partly by the higher importance of non-means tested benefits in some of the countries. In fact, when considering the inequality-reducing effect of non-means tested benefits, we find that in Sweden, Finland and Denmark non-means tested benefits have the largest inequality-reducing effect (above 0.04 percentage points). On the other hand, in countries such as Poland, Portugal, Italy, Greece, Croatia and Bulgaria, non-means tested have the smallest anti-inequality effect just below 0.01 percentage points.

Table 4 shows us that income tax systems can have differential effects on inequality. In particular, the largest inequality-reducing effect of direct taxes can be found in Belgium, Germany, Ireland, Luxembourg and Netherlands where the Gini coefficient increases by over 0.06 percentage points when direct taxes are added back to disposable income. These countries are characterized by progressive tax systems, which could explain the equalising effect of direct taxes on the income distribution. On the contrary, in Bulgaria and Hungary direct taxes do not substantially affect inequality, likely related to their flat tax systems. Finally, as far as SICs are concerned, in Belgium and Slovenia SICs have a modest (slightly above 0.02 percentage points) inequality reducing effect, while they have a negligible effect in the majority of other countries.

Looking at changes between 2017 and 2020, the effects of taxes and benefits instruments in reducing income inequality seem to have remained largely stable over time. The exceptions to note would be Romania and Lithuania, where changes to SIC policies in 2018 and 2019 respectively had large inequality reducing effects, and Poland, where changes to the 2020 system moved the balance from means-tested benefits to non-means-tested benefits in terms of the effort to reduce income inequality.

Table 4. Effects of tax-benefit components on Gini coefficient: 2017-2020

	Policy year	Disposable income (DPI)	DPI less means-tested benefits	DPI less non means-tested benefits	DPI plus direct taxes	DPI plus Social Insurance Contrib.	Original Income	Original Income plus pensions
Belgium	2017	0.223	0.247	0.242	0.294	0.247	0.489	0.337
	2018	0.223	0.247	0.243	0.294	0.247	0.489	0.337
	2019	0.222	0.247	0.242	0.293	0.246	0.489	0.337
	2020	0.220	0.246	0.240	0.291	0.244	0.489	0.336
Bulgaria	2017	0.392	0.409	0.401	0.399	0.397	0.539	0.428
	2018	0.394	0.412	0.404	0.402	0.399	0.541	0.431
	2019	0.399	0.415	0.408	0.407	0.405	0.541	0.435
	2020	0.400	0.416	0.409	0.408	0.405	0.541	0.435
Czechia	2017	0.232	0.244	0.243	0.262	0.249	0.437	0.294
	2018	0.235	0.246	0.246	0.265	0.251	0.436	0.296
	2019	0.235	0.245	0.246	0.265	0.250	0.436	0.294
	2020	0.225	0.235	0.238	0.255	0.241	0.436	0.287
Denmark	2017	0.247	0.292	0.291	0.300	0.248	0.450	0.361
	2018	0.248	0.292	0.292	0.301	0.249	0.450	0.360
	2019	0.249	0.292	0.293	0.301	0.250	0.451	0.360
	2020	0.253	0.295	0.296	0.305	0.253	0.453	0.363
Germany	2017	0.278	0.300	0.296	0.340	0.292	0.505	0.370
	2018	0.278	0.299	0.296	0.340	0.291	0.504	0.369
	2019	0.279	0.299	0.296	0.340	0.292	0.504	0.368
	2020	0.275	0.296	0.294	0.336	0.288	0.504	0.366
Estonia	2017	0.299	0.306	0.320	0.322	0.303	0.449	0.347
	2018	0.289	0.294	0.312	0.321	0.293	0.449	0.346
	2019	0.289	0.293	0.312	0.320	0.293	0.449	0.346
	2020	0.289	0.292	0.311	0.319	0.292	0.449	0.344
Ireland	2017	0.301	0.368	0.320	0.385	0.312	0.535	0.466
	2018	0.304	0.370	0.322	0.387	0.315	0.536	0.467
	2019	0.305	0.372	0.323	0.389	0.316	0.536	0.469
	2020	0.308	0.371	0.326	0.391	0.319	0.534	0.467
Greece	2017	0.306	0.337	0.310	0.337	0.318	0.549	0.372
	2018	0.306	0.338	0.310	0.338	0.319	0.550	0.374
	2019	0.307	0.335	0.311	0.342	0.319	0.550	0.373
	2020	0.317	0.343	0.322	0.353	0.323	0.550	0.377
Spain	2017	0.324	0.353	0.336	0.370	0.322	0.511	0.402
	2018	0.324	0.353	0.336	0.371	0.322	0.511	0.401
	2019	0.322	0.353	0.334	0.369	0.320	0.512	0.401
	2020	0.315	0.352	0.326	0.363	0.313	0.512	0.401
France	2017	0.267	0.305	0.290	0.310	0.278	0.494	0.366
	2018	0.270	0.307	0.293	0.311	0.280	0.494	0.367
	2019	0.273	0.309	0.296	0.313	0.280	0.494	0.367
	2020	0.272	0.309	0.296	0.312	0.280	0.494	0.367
Italy	2017	0.331	0.348	0.335	0.383	0.338	0.529	0.402
	2018	0.331	0.348	0.336	0.383	0.339	0.528	0.403
	2019	0.328	0.348	0.332	0.380	0.335	0.529	0.402
	2020	0.324	0.346	0.330	0.376	0.332	0.529	0.402

	Policy year	Disposable income (DPI)	DPI less means-tested benefits	DPI less non means-tested benefits	DPI plus direct taxes	DPI plus Social Insurance Contrib.	Original Income	Original Income plus pensions
Cyprus	2017	0.293	0.326	0.304	0.322	0.294	0.450	0.364
	2018	0.294	0.326	0.305	0.323	0.295	0.450	0.365
	2019	0.294	0.328	0.305	0.322	0.297	0.450	0.365
	2020	0.293	0.328	0.305	0.320	0.296	0.450	0.365
Latvia	2017	0.349	0.352	0.363	0.375	0.359	0.491	0.399
	2018	0.347	0.351	0.363	0.376	0.358	0.491	0.400
	2019	0.347	0.350	0.362	0.376	0.358	0.490	0.400
	2020	0.344	0.348	0.358	0.375	0.355	0.490	0.399
Lithuania	2017	0.359	0.368	0.371	0.381	0.368	0.515	0.407
	2018	0.349	0.360	0.369	0.370	0.359	0.514	0.404
	2019	0.341	0.351	0.364	0.370	0.365	0.509	0.412
	2020	0.317	0.331	0.345	0.348	0.343	0.509	0.402
Luxembourg	2017	0.253	0.288	0.289	0.320	0.260	0.503	0.378
	2018	0.253	0.288	0.288	0.319	0.260	0.503	0.378
	2019	0.253	0.289	0.288	0.320	0.260	0.503	0.378
	2020	0.253	0.289	0.287	0.320	0.260	0.503	0.378
Hungary	2017	0.318	0.324	0.342	0.313	0.327	0.480	0.350
	2018	0.319	0.324	0.341	0.318	0.330	0.480	0.354
	2019	0.321	0.325	0.341	0.322	0.334	0.480	0.358
	2020	0.320	0.325	0.341	0.322	0.334	0.480	0.358
Croatia	2017	0.289	0.304	0.298	0.318	0.309	0.484	0.353
	2018	0.289	0.303	0.299	0.319	0.309	0.484	0.354
	2019	0.288	0.303	0.298	0.318	0.308	0.484	0.354
	2020	0.291	0.305	0.300	0.319	0.311	0.484	0.354
Malta	2017	0.282	0.308	0.292	0.318	0.284	0.453	0.351
	2018	0.284	0.309	0.294	0.321	0.286	0.453	0.353
	2019	0.285	0.310	0.295	0.322	0.287	0.453	0.354
	2020	0.279	0.306	0.289	0.317	0.282	0.453	0.351
Netherlands	2017	0.260	0.308	0.291	0.322	0.273	0.422	0.372
	2018	0.260	0.309	0.291	0.322	0.273	0.423	0.372
	2019	0.259	0.309	0.291	0.321	0.274	0.423	0.372
	2020	0.257	0.309	0.289	0.316	0.272	0.423	0.371
Austria	2017	0.251	0.283	0.281	0.307	0.266	0.488	0.362
	2018	0.251	0.283	0.281	0.308	0.267	0.488	0.362
	2019	0.248	0.279	0.277	0.308	0.265	0.488	0.362
	2020	0.244	0.274	0.275	0.305	0.261	0.488	0.362
Poland	2017	0.269	0.300	0.276	0.284	0.275	0.461	0.322
	2018	0.274	0.303	0.281	0.290	0.281	0.461	0.326
	2019	0.276	0.303	0.288	0.291	0.284	0.462	0.331
	2020	0.278	0.289	0.308	0.294	0.287	0.463	0.337
Portugal	2017	0.314	0.332	0.323	0.372	0.324	0.526	0.400
	2018	0.315	0.333	0.325	0.371	0.325	0.526	0.400
	2019	0.315	0.334	0.324	0.371	0.324	0.526	0.400
	2020	0.315	0.333	0.324	0.371	0.324	0.526	0.400
Romania	2017	0.332	0.352	0.347	0.349	0.351	0.524	0.393
	2018	0.340	0.357	0.354	0.350	0.383	0.531	0.412

	2019	0.337	0.352	0.356	0.347	0.382	0.531	0.413
	2020	0.344	0.357	0.363	0.353	0.386	0.537	0.415
Slovenia	2017	0.236	0.259	0.260	0.269	0.259	0.451	0.320
	2018	0.231	0.260	0.254	0.265	0.255	0.451	0.320
	2019	0.233	0.260	0.257	0.267	0.257	0.451	0.321
	2020	0.233	0.262	0.257	0.264	0.255	0.453	0.319
Slovakia	2017	0.203	0.215	0.224	0.220	0.216	0.381	0.257
	2018	0.205	0.217	0.225	0.223	0.219	0.381	0.259
	2019	0.207	0.219	0.226	0.226	0.222	0.381	0.262
	2020	0.204	0.216	0.225	0.223	0.219	0.381	0.260
Finland	2017	0.239	0.280	0.281	0.289	0.255	0.506	0.365
	2018	0.240	0.281	0.282	0.290	0.257	0.506	0.366
	2019	0.241	0.282	0.283	0.291	0.258	0.506	0.366
	2020	0.240	0.281	0.282	0.291	0.257	0.506	0.366
Sweden	2017	0.258	0.279	0.312	0.298	0.262	0.469	0.356
	2018	0.254	0.274	0.309	0.296	0.257	0.468	0.354
	2019	0.257	0.277	0.311	0.298	0.260	0.469	0.355
	2020	0.257	0.278	0.311	0.296	0.260	0.468	0.354
United Kingdom	2017	0.296	0.361	0.326	0.339	0.313	0.485	0.438
	2018	0.308	0.371	0.339	0.355	0.324	0.494	0.449
	2019	0.312	0.373	0.342	0.358	0.328	0.495	0.450
	2020	0.305	0.371	0.334	0.350	0.321	0.495	0.448

Source: EUROMOD version I3.0+
Note: EUROMOD figures for 2017-2020 for all countries, except for the UK, are based on SILC 2018 (2017 incomes). For the UK, results are based on FRS 2017/18.

4. Comparing EUROMOD estimates with external statistics

In this section, we compare the poverty and inequality baseline results obtained from EUROMOD with external aggregate statistics. The results from the baseline can be assessed in two ways. The first is to compare aggregate values for expenditure on benefits, revenues from taxes and contributions, and recipients/payers of benefits/taxes, with figures taken from external statistics, usually official administrative sources. The second is to compare poverty and inequality indicators, such as those provided in Table 1, with similar estimates obtained directly from the EU-SILC data provided by Eurostat. These methods are considered in turn below.

4.1 Comparison with external aggregate statistics

This process is known as “macro-validation” and the comparisons for each country are documented in detail in the Country Reports. Comparisons are made between the weighted number of recipients/payers for each policy instrument (simulated or not simulated) in the EUROMOD baseline with figures taken from national administrative statistics for the same period. Similarly, the amount ofannual benefits expenditure and tax revenues is compared for EUROMOD and national administrative estimates. Comparisons are often not straightforward to carry out for a number of reasons. First, the administrative statistics may refer to a different reference time period or unit of analysis than EUROMOD (this applies particularly to recipients/payers of an instrument). Secondly, the administrative statistics may not refer to the same distinct instruments or income components that are itemised in EUROMOD. They may refer to sub-instruments or to combinations of several income components. Thirdly, in some countries for some instruments the statistics may only be available at the regional level. In some cases, they are only available with a long time delay and in others they are not made publicly available at all.

Furthermore, the process of validation is cumulative. If there is a problem with one income component this will also affect the precision of simulation of the components which rely on it. As an example, if earnings are under-reported in the survey – not only will social contributions be under- estimated, but so will be the size of any tax relief on the contributions. Thus, income taxes will be over-estimated for this reason, but at the same time under-estimated because of the under-reporting of earnings. The problem with the latter effect may seem less serious than it is, because of the former effect.

Here we summarize the main challenges that typically arise by comparing EUROMOD results with national administrative statistics across countries.

1) First, it is not the case that the same patterns of over- or under- estimation can be observed across countries. For example, income taxes may be under-estimated because market incomes are under-reported or the available survey generally does not adequately represent high income taxpayers (as in the UK). Further, income tax may be over-estimated because of lack of modelling of tax evasion (as in Latvia). It may also be over-estimated because it is not possible to model or measure the size of some tax reliefs and common tax avoidance measures (as in Portugal). Finally, it may be under- or over-estimated because of under- or over-estimation of simulated income components which are taxable.
2) The simulations are only as good as the underlying SILC data and, in the cases where it is necessary, as good as the imputation of income components from the UDB aggregates. Their quality also depends on the level of complexity of national tax and benefit systems.
3) Our assessment of whether a simulation is "good enough" depends on the importance of the instrument in total household disposable income, generally. If the instrument is small or affects few people, then it is less likely to match external statistics (not least, due to sampling variability) – and it is less important that it does so – than if it is an important component of household income.
4) As indicated above, non take-up of benefits, or the application of local discretion decisions in the assignment of benefits, leads EUROMOD to over-simulate means-tested benefits in many instances (see also Appendix 3). In many countries, social assistance receipt is over-simulated by a factor of 2 or 3. The size of this effect (e.g. on poverty risk) varies with the emphasis on this type of benefit in each national system. Adjustments to account for non take-up behaviour can be applied, but these can only be approximate. If the EU-SILC data adequately capture social assistance benefit recipients and payments (for example), then one solution is to tie "eligibility" to those with recorded receipt in the data. This results in baseline estimates that compare well with the SILC but might be less appropriate when modelling policy changes or "what if" scenarios involving new benefit entitlements, or swapping policies across countries. Examples of the treatment of non take-up and tax evasion are given in Appendix 3.

4.2 Why are poverty and inequality indicators estimated by EUROMOD different from those calculated using EU-SILC data?

Table 5 compares EUROMOD baseline results on poverty and inequality with official statistics published by Eurostat: EUROMOD results based on 2017 policies and incomes are compared to Eurostat figures based on EU-SILC 2018. Given that EUROMOD uses SILC as its input data, one would expect the estimates for the base year 2017 to be the most closely related. This comparison is of some use for validation purposes as, if the two sets of estimates are very different, this may suggest some problem with the simulations or the input data. However, there are several reasons for which the two sets of estimates in base years should not be expected to be identical. These include:

- The release version of EU-SILC data: EUROMOD uses release 1 or 2 of EU-SILC 2018 (when available) in most countries: details are provided in Appendix 1. Statistics provided by Eurostat are

based on the most recent release, we assume. To the extent that the relevant underlying data change between releases, we would expect differences in the indicators from the two sources.

- The UK uses a different data source in EUROMOD: the Family Resources Survey (FRS) for 2017/2018. Although from the 2012-18 data the FRS was the basis of the EU-SILC for the UK, the two datasets differ in their preparation (e.g. different imputations) and sample size (EU-SILC includes only FRS data collected April until September).
- The standard definition of household disposable income produced by EUROMOD and used in this report is slightly different from the definition of the UDB variable (HY020) used for the official indicator calculations. In EUROMOD we do not include any non-cash employment income in the definition of disposable income (e.g., value of company car).[9] This is likely to have some effect on the income distribution, for example by reducing the median and the poverty threshold in countries with significant non-cash employment incomes in this form.
- In the EUROMOD input database we drop observations (households) from the SILC where one or more persons in the household have missing data on weights. This is not necessary in many countries, but in some countries the number of such cases varies from a few to more than 50.
- In constructing the input information used in the calculation of tax liabilities and benefit entitlements it is important that the different variables are as consistent as possible. One adjustment made to ensure that the information on the income reference period (and EUROMOD policy year) is consistent with the characteristics of the household (current at the time of the survey) is to drop children born after the EU-SILC income reference period and before the interview. This will affect household composition and hence the equivalence scale and the calculation of household equivalised disposable income.
- Finally, as mentioned above our use of simulated values for benefits and taxes without allowing for non take-up of benefits nor tax evasion in some countries, will tend to make the income distribution appear less unequal and, risk of poverty rates smaller than those calculated using the SILC directly (which itself may be subject to measurement errors). In this report, adjustments have been made to account for benefit non take-up in Belgium, Estonia, France, Spain, Greece, Ireland, Latvia, Poland, Portugal, Romania, Finland and the UK. Adjustments for tax evasion have been implemented in Bulgaria, Greece, Italy and Romania.

The EUROMOD and Eurostat/EU-SILC estimates of the poverty rate based on the 60% of the median household disposable income poverty line indeed differ, but remain bounded between 2 and -2 percentage points in 23 out of 28 countries in the base year 2017. In comparison with Eurostat figures, poverty rates are underestimated most in Luxembourg (7.4 percentage points), and to a lesser extent in Belgium (-4.8) and United Kingdom (-3.5). In Hungary, on the contrary, poverty rates are over-estimated by 9.6 percentage points and for Ireland by 2.6 percentage points. Differences with Eurostat do not appear more severe when looking at different poverty lines, calculated on the basis of 50% and 70% of the median household disposable income. The general tendency is to slightly underestimate rather than overestimate Eurostat poverty figures; the ranking of countries, however, does not seem to be affected.

[9] In a definitive reconciliation of the two sources the income measures could in principle be adjusted to include precisely the same components.

When looking at poverty rates by for children and the elderly (defined as individuals aged below 18 and over 65, respectively), the differences with EU-SILC appear a bit more pronounced, and in some countries, large. This is the case for instance of child poverty being underestimated in Luxembourg (9.1 percentage point difference), Belgium (-5.7), Malta (-5.7) and United Kingdom (5.0), and being overestimated in Hungary by 14.5 percentage points. As far as elderly poverty is concerned, instead, EUROMOD underestimates Eurostat poverty rates by between 7 and 8 percentage points in Belgium and Luxembourg and around 5 percentage points in Estonia, Latvia, Netherlands and Sweden. For Ireland, Malta and Hungary, EUROMOD overestimates elderly poverty by at least 6 percentage points in each case.

The differences with Eurostat in the estimation of the Gini coefficient seem less sizeable but involve many of the same countries: the underestimation exceeds 0.07 percentage points in Luxembourg and 0.03 percentage points in Belgium, Denmark, Germany and United Kingdom. EUROMOD overestimates the Gini by around 0.03 percentage points in Hungary.

In understanding these discrepancies among the factors to be taken into account are the following:

- Over-simulation of some particular means-tested benefits can explain some of the low EUROMOD poverty rates. Over-simulation might result from several factors alone or in combination: unobserved differences at the municipality level, lack of information to simulate asset tests where these exist, and non take-up.[10] For example (a) social assistance in Slovakia leading to underestimation of poverty rates, and (b) income support in Belgium due to the difficulty of fully capturing the means-test in the simulations, which leads to low poverty rates.
- In many countries groups of elderly people are concentrated around the 60% median poverty threshold meaning that their risk of poverty is sensitive to small shifts in the poverty line. This discrepancy is also driven by the over-simulation of pensions in EUROMOD. Comparisons of the threshold itself are only straightforward for the euro-zone countries.[11]
- Over-simulation of income taxes can lead to under-estimation of inequality and of median disposable income, and hence the risk of poverty estimates. The main contributing factors are the existence of tax evasion, which is not typically captured, and the non-simulation of some tax deductions due to lack of necessary information.

[10] It is worth noting that in some countries simulated means-tested benefits correspond very well to external statistics; higher poverty estimates in the EU-SILC may also be due to under-reporting of benefits in the data. For example, Unemployment Benefit II in Germany has been oversimulated in comparison to EU-SILC input data. However, macrovalidation results show that the benefit is accurately simulated when compared to official statistics. These results clearly point out to issues in the EU-SILC input data. e.g. underreporting of the benefit. 11 For non-euro-zone countries the comparison of the threshold is complicated by the choice of exchange rate to use and this makes a difference in cases where this is changing over the data and policy simulation reference period. In the policy simulation we use the exchange rate prevailing at 30th June 2017.

Table 5. Comparison of baseline poverty and inequality statistics: EUROMOD output (2017 incomes and policies) vs. Eurostat EU-SILC estimates

	Policy year	Poverty risk			Poverty risk (60%)		Poverty threshold	Gini
		50%	60%	70%	age <18	age>=65	€/year	
Belgium	EUROMOD	6.4	11.6	20.7	14.4	9.0	13,545	0.223
	Eurostat	9.0	16.4	25.6	20.1	16.6	14,212	0.257
Bulgaria	EUROMOD	15.3	22.9	29.6	26.5	32.0	2,225	0.392
	Eurostat	15.4	22.0	29.2	26.6	29.2	2,154	0.396
Czech Republic	EUROMOD	4.6	9.2	17.3	10.1	12.8	5,387	0.232
	Eurostat	4.4	9.6	17.1	11.0	14.2	5,453	0.240
Denmark	EUROMOD	4.6	10.7	18.9	9.9	5.9	17,886	0.247
	Eurostat	6.8	12.7	20.8	11.0	8.9	18,062	0.278
Germany	EUROMOD	8.0	14.3	22.4	12.8	16.8	13,467	0.278
	Eurostat	9.8	16.0	23.7	14.5	18.2	13,628	0.311
Estonia	EUROMOD	11.6	21.2	29.5	16.6	42.0	6,078	0.299
	Eurostat	13.9	21.9	30.1	15.2	46.3	6,314	0.306
Ireland	EUROMOD	7.9	17.5	26.9	20.2	26.1	14,095	0.301
	Eurostat	7.1	14.9	24.1	15.8	20.2	14,952	0.289
Greece	EUROMOD	11.3	17.0	24.8	22.8	8.9	4,925	0.306
	Eurostat	12.9	18.5	26.4	22.7	11.6	4,718	0.323
Spain	EUROMOD	14.3	21.1	28.9	26.2	14.0	8,788	0.324
	Eurostat	14.6	21.5	28.9	26.8	14.8	8,871	0.332
France	EUROMOD	5.7	12.0	20.7	18.3	7.7	13,170	0.267
	Eurostat	6.7	13.4	21.1	19.9	8.3	13,332	0.285
Italy	EUROMOD	13.8	20.0	27.9	25.8	13.4	9,681	0.331
	Eurostat	13.6	20.3	28.3	26.2	15.3	10,106	0.334
Cyprus	EUROMOD	7.2	16.4	25.8	20.6	23.6	9,464	0.293
	Eurostat	8.4	15.4	25.2	17.3	21.4	9,202	0.291
Latvia	EUROMOD	15.6	22.3	30.1	17.3	41.4	4,127	0.349
	Eurostat	16.3	23.3	30.3	17.5	45.7	4,400	0.356
Lithuania	EUROMOD	15.1	21.9	29.2	22.8	35.0	3,977	0.359
	Eurostat	15.8	22.9	30.7	23.9	37.7	4,137	0.369
Luxembourg	EUROMOD	1.7	10.9	22.8	13.6	5.0	21,571	0.253
	Eurostat	11.9	18.3	26.6	22.7	12.1	24,162	0.332
Hungary	EUROMOD	16.8	22.4	28.9	28.3	18.7	3,044	0.318
	Eurostat	8.0	12.8	23.0	13.8	9.8	3,254	0.287
Croatia	EUROMOD	13.6	19.5	26.1	19.2	29.0	4,098	0.289
	Eurostat	13.6	19.3	26.2	19.7	28.1	3,995	0.297
Malta	EUROMOD	7.6	16.8	25.0	15.7	32.3	9,079	0.282
	Eurostat	8.7	16.8	25.2	21.4	25.4	8,868	0.287
Netherlands	EUROMOD	5.7	11.6	20.0	13.5	5.6	14,206	0.260
	Eurostat	7.0	13.3	21.4	13.1	10.8	14,410	0.274
Austria	EUROMOD	6.1	14.6	22.1	18.4	13.5	14,752	0.251
	Eurostat	8.8	14.3	22.3	19.2	13.9	15,105	0.268
Poland	EUROMOD	8.4	14.0	21.8	10.0	15.4	3,932	0.269
	Eurostat	9.0	14.8	22.8	13.0	15.5	3,944	0.278
Portugal	EUROMOD	9.5	16.2	24.8	17.3	16.9	5,745	0.314
	Eurostat	10.8	17.3	25.3	19.0	17.7	5,607	0.321
Romania	EUROMOD	17.0	23.5	31.0	31.4	23.3	2,052	0.332
	Eurostat	17.2	23.5	30.1	32.0	20.8	1,970	0.351
Slovenia	EUROMOD	7.2	13.5	21.0	11.8	17.6	7,694	0.236
	Eurostat	6.9	13.3	20.7	11.7	18.3	7,946	0.234
Slovakia	EUROMOD	6.4	10.7	17.3	17.5	4.8	4,466	0.203

	Policy year	Poverty risk			Poverty risk (60%)		Poverty threshold	Gini
		50%	60%	70%	age <18	age>=65	€/year	
	Eurostat	6.3	12.2	16.7	20.5	6.4	4,477	0.209
Finland	EUROMOD	3.3	10.4	18.9	9.5	10.8	14,525	0.239
	Eurostat	5.4	12.0	20.9	11.1	13.2	14,727	0.259
Sweden	EUROMOD	8.3	15.2	24.0	17.9	10.0	15,223	0.258
	Eurostat	9.5	16.4	24.5	19.3	14.6	15,324	0.270
United Kingdom	EUROMOD	8.0	15.1	23.9	18.5	17.7	12,181	0.296
	Eurostat	11.3	18.6	26.5	23.5	20.4	12,878	0.335

Source: EUROMOD version I3.0+
Note: EUROMOD figures for all countries, except for the UK, are based on SILC 2018 (2017 incomes). For the UK, results are based on FRS 2017/18 (2017 incomes).

5. Work incentives: estimates of marginal effective tax rates

EUROMOD can be used to calculate the effect of tax and benefit systems on work incentives. In Table 6, we provide mean and median marginal effective tax rates (METR) based on 2018 data for 4 policy years (from 2017 to 2020) for the 28 EU countries.

EUROMOD calculates METRs for all individuals with earned income, taking account of the effect of earning 3% more such income (in gross terms) on their household disposable income. Following Jara and Tumino (2013), we present METR results for individuals of working age (18-64) who have more than 1 unit of national currency of monthly earnings. We exclude from our calculations the top percentile of the METR distribution if the value is above 150% and the lowest percentile if the value of METR is negative. The latter exclusions are made in order for average METR to be less sensitive to "outliers", although such values are in principle plausible.

There can be different ways of calculating METR, depending on the interpretation that one wishes to place upon them, and comparability issues across countries should be borne in mind. One such issue relates to the treatment of benefit non take-up and tax evasion for the calculation of METR. The results presented below assume full take-up of benefits in all countries. In Bulgaria, Greece, Romania and Italy, where tax evasion has been modelled and used to obtain baseline statistics, full compliance has been assumed for the calculation of METRs. Hence, in all countries, all of the marginal earnings are assumed to be earned in the official economy and are subject to taxes, contributions and benefit withdrawal, assuming full compliance. From the methodological standpoint, whether or not to take evasion into account at all when measuring work incentives is therefore an issue to consider. This depends very much on whether the METRs are to be considered as indicators of the effects of the design of the tax-benefit system on marginal earnings that are retained; or whether they are to be interpreted as calculations of the marginal return to additional work in practice, taking into account opportunities to evade. Further, the METRs focus on the components of disposable income and hence exclude employer SIC. Therefore, these calculations do not reflect the overall tax wedge.

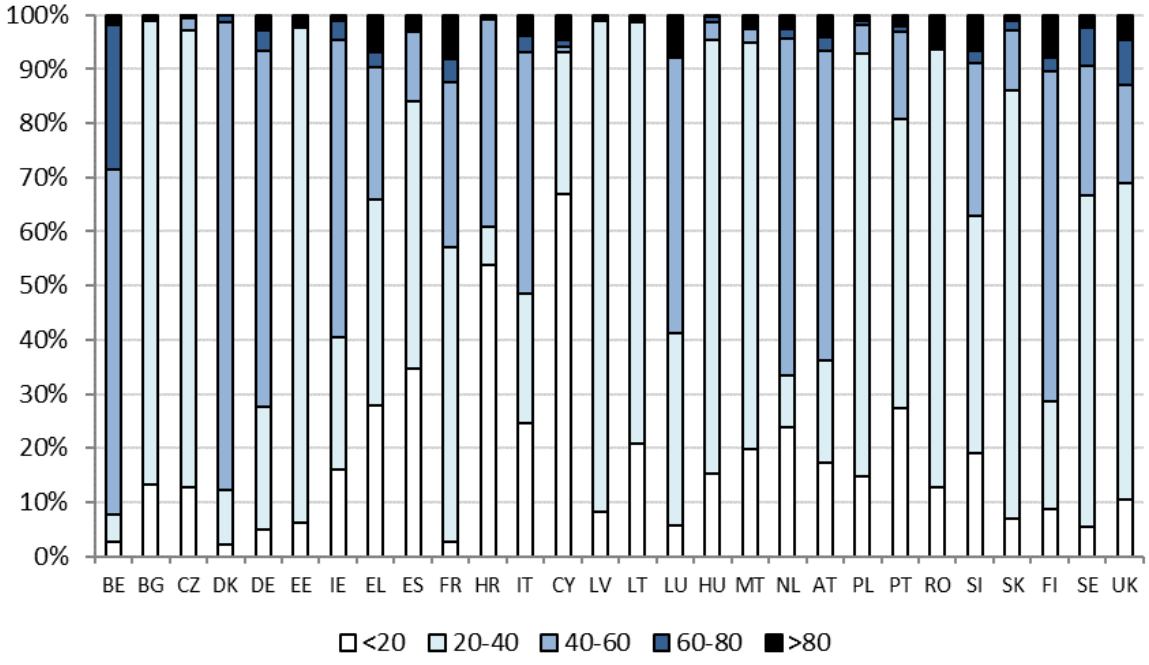
Table 6 shows that Belgium exhibits by far the highest mean METR (56%), followed by Denmark, Luxembourg, Germany and Finland, where METRs range between 44% and 46%. The lowest mean METRs are observed in Cyprus, Estonia and Bulgaria (below 25%). The ranking of countries remains largely the same when ranked by the median METR instead of the mean. The table is also useful to understand which countries have made progress towards reducing disincentives to labour market participation over the period considered, and which have worsened in the ranking. Looking at mean METR, Lithuania is the country with the largest increase in disincentives between 2017 and 2020 (15 percentage points), followed by Romania (+9). Both countries saw a similar sized reduction in median METR. In each case, increases are generated by reforms to SICs. For Lithuania, a recalculation of SICs in 2019, which resulted in recalculation of all the gross wages in Lithuania, causes this jump. These reforms resulted in substantially higher gross original income; nevertheless, the change was

absorbed by the changes in PIT and SIC. For Romania, the large increase in METRS generated by SICs is due to a reform in 2018 that transferred all SICs paid by the employer onto the employee (the total SIC payable by employer and employee has not increased and even fallen in some cases). The same reform lowered the personal income tax rate from 16% to 10% which is behind the large fall in METRs coming from taxes.

Even though average METRs already give a good indication of work incentives across countries, the distribution of METRs provides a more complete picture. Figure 3 shows the share of the working population with different levels of work incentives (under 20%, 20% to under 40%, 40% to under 60%, 60% to under 80% and 80% and above) for the 2017 policy system.

In a few countries, an important share of the working population show low METRs (below 20%). This is the case in Cyprus (67%), Croatia (54%), Spain (35%), Greece (28%) and Portugal (28%). On the other hand, the distribution of METR is very concentrated at higher levels (e.g. between 40% and 60%) in Denmark (86% of the working population has METR between 40% and 60%), Germany (66%), Belgium (64%), Netherlands (62%), Finland (61%) and Austria (57%). Further, there are cases where there are large shares of the population in paid work both with relatively low and relatively high marginal rates (Luxembourg, Ireland, France and Italy). In almost all countries there is a small minority facing very low incentives (i.e. METRs over 80%) which typically occurs because of the interaction of tax and contributions with benefit withdrawal, or because of discontinuities in entitlement to benefits or tax concessions. For example, in Romania, there are a number of means-tested benefits where income below a threshold brings entitlement to the full amount while income above the threshold results in zero entitlement. The share of working people with such high METRs is 5% or more in Greece, Luxembourg, Finland, Romania, Slovenia and France.

Figure 3. Marginal effective tax rates 2017: share of population in paid work (%) by range of METR



Source: EUROMOD version I3.0+
Note: EUROMOD figures for all countries, except for the UK, are based on SILC 2018 (2017 incomes). For the UK, results are based on FRS 2017/18.

Table 6. Mean and median Marginal effective tax rates: 2017-2020

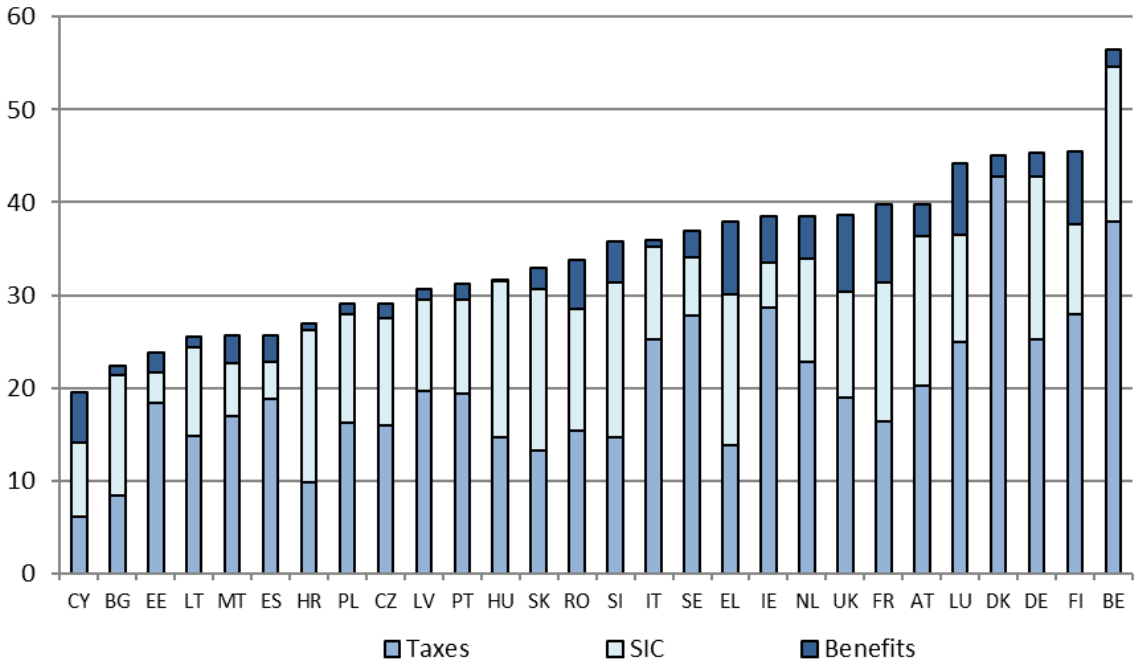
		2017	2018	2019	2020
Belgium	Mean	56.4	56.0	55.8	55.8
	Median	56.4	56.3	56.2	56.1
Bulgaria	Mean	22.4	23.2	23.1	23.0
	Median	22.0	22.4	22.4	22.4
Czechia	Mean	29.0	29.0	28.9	28.9
	Median	31.1	31.1	31.1	31.1
Denmark	Mean	45.3	45.0	44.6	44.2
	Median	42.8	42.9	42.1	42.1
Germany	Mean	45.3	43.5	43.4	43.5
	Median	44.5	44.5	44.4	44.4
Estonia	Mean	23.8	25.1	25.6	25.7
	Median	22.9	22.9	22.9	22.9
Ireland	Mean	39.0	39.1	39.2	35.2
	Median	49.0	48.8	48.5	48.5
Greece	Mean	37.9	37.5	32.9	29.1
	Median	36.1	36.3	36.1	33.0
Spain	Mean	25.7	25.6	25.6	27.4
	Median	28.8	28.8	28.8	28.8
France	Mean	39.7	39.3	37.9	37.5
	Median	37.2	37.5	35.6	34.1
Italy	Mean	36.0	36.5	37.8	37.5
	Median	40.6	41.3	43.3	43.1
Cyprus	Mean	19.5	19.5	20.7	21.3
	Median	8.4	8.4	10.7	11.6
Latvia	Mean	30.6	30.2	30.0	30.4
	Median	31.1	29.3	31.8	31.8
Lithuania	Mean	25.4	26.2	40.4	40.9
	Median	29.9	31.4	44.3	45.2
Luxembourg	Mean	44.1	44.8	45.0	44.9
	Median	44.0	44.2	44.7	46.4
Hungary	Mean	31.7	31.6	31.5	31.2
	Median	34.5	34.5	34.5	34.5
Croatia	Mean	26.7	27.6	28.3	26.6
	Median	20.0	20.0	27.5	20.0
Malta	Mean	25.6	26.0	26.4	27.2
	Median	25.0	25.0	25.0	25.0
Netherlands	Mean	39.1	39.1	38.7	38.5
	Median	48.3	48.4	48.9	48.5
Austria	Mean	39.8	40.1	40.0	39.9
	Median	43.3	43.3	43.3	43.3
Poland	Mean	29.0	29.2	29.4	27.1
	Median	30.3	30.3	30.3	28.1
Portugal	Mean	31.2	30.3	31.6	32.0
	Median	34.2	34.0	34.0	34.0
Romania	Mean	33.8	42.6	41.9	42.5
	Median	33.1	44.6	41.5	41.5
Slovenia	Mean	35.7	37.7	37.8	37.0
	Median	36.3	39.5	39.7	38.9
Slovakia	Mean	32.9	32.8	32.7	32.2
	Median	29.9	29.9	29.9	29.9
Finland	Mean	45.6	45.4	45.3	46.0
	Median	45.7	45.8	45.9	46.6
Sweden	Mean	36.9	36.2	35.4	35.0
	Median	32.3	32.4	32.4	32.5
United Kingdom	Mean	38.6	38.4	37.4	38.6
	Median	34.3	34.5	34.3	34.6

Source: EUROMOD version I3.0+

Note: EUROMOD figures for all countries, except for the UK, are based on SILC 2018 (2017 incomes). For the UK, results are based on FRS 2017/18.

Figure 4 presents the decomposition by components of average METR for each country in the base year 2017. Average METR have been decomposed into three main components: taxes, representing the average increase in taxes paid at the household level as a proportion of the increase in individual gross earnings; social insurance contributions, including changes in both employee and self-employed social insurance contributions; and benefits, representing the average reduction in benefits and pensions paid at the household level as a proportion of the increase in earnings. The results of the decomposition for all the policy years 2017-2020 are reported in Table 7.

Figure 4. Marginal effective tax rates (%) by income component, 2017



Source: EUROMOD version I3.0+

Note: Countries have been ranked according to the total (mean) marginal effective tax rate. EUROMOD figures for all countries, except for the UK, are based on SILC 2018 (2017 incomes). For the UK, results are based on FRS 2017/18.

Despite a wide variation across countries, the graph shows that the tax component is usually the most important, the size of it varying significantly across countries and ranging from relatively low values in Cyprus, Bulgaria and Croatia, to relatively high values in Denmark, Belgium, Finland, Ireland, Italy and Sweden.

In Denmark, almost all of average METR is accounted for by taxes. While in Belgium, Finland, Ireland, Italy and Sweden the share of taxes is lower but still accounting for most of the average METR. Nordic countries together with Ireland and Belgium also have the highest METR due to taxes in absolute terms (all over 27%), while taxes seem to offer less disincentive to work at the margin in Cyprus, Bulgaria and Croatia, countries which are also characterized by a relatively flat wage distribution. Countries where the contribution of SIC to METR is the largest are instead Hungary, Austria, Greece, Croatia, Germany, Slovenia, Slovakia and Belgium in all cases above 15%. At the other end of the spectrum, in Malta, Spain, Estonia, Ireland, Sweden and Denmark, the SIC contribution to METR is the lowest, below 7 percentage points (in Estonia, for example, most of SICs are paid by employers). In a few countries, the contribution of benefits is also relevant to the mean METR, however to a minor extent if compared to SIC and especially to taxes: this is the case of United Kingdom, Luxembourg, Finland and France.

The METR estimates presented here show only a very small selection of indicators of work incentives that may be of interest. Breakdowns by gender, family status, employment status and analysis of METRS across the income distribution are examples of additional analysis that can be carried out using EUROMOD.

Table 7. Marginal effective tax rates by income component: 2017-2020

	Policy year	Taxes	SIC	Benefits	Total (mean)
Belgium	2017	37.9	16.7	1.8	56.4
	2018	37.7	16.5	1.7	56.0
	2019	37.7	16.4	1.8	55.8
	2020	37.5	16.4	2.0	55.8
Bulgaria	2017	8.4	13.0	1.0	22.4
	2018	8.3	13.4	1.5	23.2
	2019	8.3	13.4	1.4	23.1
	2020	8.3	13.3	1.3	23.0
Czechia	2017	16.0	11.5	1.7	29.1
	2018	16.2	11.3	1.5	29.0
	2019	16.4	11.2	1.3	28.9
	2020	16.5	11.0	1.3	28.9
Denmark	2017	42.8	0.0	2.3	45.3
	2018	42.6	0.0	2.2	45.0
	2019	42.4	0.0	2.0	44.6
	2020	42.3	0.0	1.7	44.2
Germany	2017	25.2	17.6	2.6	45.3
	2018	24.7	15.6	3.2	43.5
	2019	24.8	15.6	3.0	43.4
	2020	24.5	15.8	3.2	43.5
Estonia	2017	18.4	3.3	2.1	23.8
	2018	19.8	3.2	2.1	25.1
	2019	20.3	3.2	2.1	25.6
	2020	20.5	3.2	2.0	25.7
Ireland	2017	28.6	4.9	5.0	39.0
	2018	28.9	4.9	4.8	39.1
	2019	29.2	4.9	4.7	39.2
	2020	29.9	-0.4	5.3	35.2
Greece	2017	13.9	16.3	7.8	37.9
	2018	14.6	16.0	6.9	37.5
	2019	15.6	15.3	2.0	32.9
	2020	15.5	12.2	1.3	29.1
Spain	2017	18.8	4.0	2.9	25.7
	2018	18.9	4.0	2.7	25.6
	2019	19.0	3.7	2.8	25.6
	2020	19.3	3.6	4.4	27.4
France	2017	16.4	15.0	8.3	39.7
	2018	18.4	12.8	8.1	39.3
	2019	18.3	11.3	8.4	37.9
	2020	17.9	11.3	8.4	37.5

	Policyyear	Taxes	SIC	Benefits	Total (mean)
Italy	2017	25.2	10.0	0.8	36.0
	2018	25.5	10.1	0.9	36.5
	2019	25.6	10.1	2.0	37.8
	2020	25.9	10.1	1.5	37.5
Cyprus	2017	6.1	7.9	5.4	19.5
	2018	6.4	7.9	5.2	19.5
	2019	5.8	10.2	4.7	20.7
	2020	5.3	11.2	4.8	21.3
Latvia	2017	19.6	9.9	1.1	30.6
	2018	18.6	10.7	1.0	30.2
	2019	18.6	10.6	0.8	30.0
	2020	18.7	10.6	1.0	30.4
Lithuania	2017	14.8	9.6	1.0	25.4
	2018	15.3	9.5	1.5	26.2
	2019	18.3	21.1	1.0	40.3
	2020	18.0	21.2	1.7	40.9
Luxembourg	2017	24.9	11.6	7.7	44.1
	2018	24.9	11.6	8.3	44.8
	2019	25.5	11.6	8.0	45.0
	202	26.0	11.6	7.2	44.8
Hungary	2017	14.7	16.8	0.1	31.7
	2018	14.7	16.8	0.1	31.6
	2019	14.7	16.7	0.1	31.5
	2020	14.6	16.5	0.1	31.2
Croatia	2017	9.7	16.4	0.7	26.9
	2018	10.5	16.4	0.6	27.6
	2019	11.2	16.4	0.7	28.3
	2020	9.5	16.4	0.7	26.6
Malta	2017	17.0	5.7	2.9	25.6
	2018	17.3	6.1	2.6	26.0
	2019	17.9	5.6	3.0	26.4
	2020	17.8	5.8	3.7	27.2
Netherlands	2017	22.9	11.0	4.6	39.1
	2018	23.0	10.8	4.7	39.1
	2019	22.1	11.2	4.8	38.7
	2020	21.1	10.6	6.3	38.5
Austria	2017	20.2	16.1	3.5	39.8
	2018	20.5	16.1	3.4	40.1
	2019	20.4	16.2	3.4	40.0
	2020	20.2	16.3	3.4	39.9
Poland	2017	16.3	11.6	1.2	29.0
	2018	16.5	11.6	1.0	29.2
	2019	16.7	11.6	1.1	29.4
	2020	15.6	10.7	0.9	27.1
Portugal	2017	19.4	10.1	1.7	31.2
	2018	18.4	10.1	1.7	30.3

	Policy year	Taxes	SIC	Benefits	Total (mean)
	2019	18.7	11.2	1.7	31.6
	2020	19.1	11.2	1.7	32.0
Romania	2017	15.4	13.1	5.3	33.8
	2018	8.5	27.4	6.8	42.6
	2019	8.3	27.4	6.3	41.9
	2020	8.0	27.4	7.2	42.5
Slovenia	2017	14.6	16.8	4.3	35.7
	2018	15.1	16.8	5.8	37.7
	2019	15.4	16.8	5.7	37.8
	2020	14.4	16.7	5.8	37.0
Slovakia	2017	13.2	17.5	2.2	32.9
	2018	13.4	17.4	2.0	32.8
	2019	13.6	17.2	1.9	32.7
	2020	13.2	17.0	1.9	32.2
Finland	2017	28.0	9.7	7.9	45.6
	2018	27.4	10.1	7.9	45.4
	2019	27.5	10.1	7.7	45.3
	2020	28.1	10.0	7.9	46.0
Sweden	2017	27.8	6.3	2.8	36.9
	2018	27.2	6.3	2.7	36.2
	2019	26.5	6.2	2.7	35.4
	2020	26.2	6.0	2.7	35.0
United Kingdom	2017	18.9	11.5	8.2	38.6
	2018	19.0	11.6	7.7	38.4
	2019	18.6	11.8	7.0	37.4
	2020	18.6	11.6	8.4	38.6

Source: EUROMOD version I3.0+
Note: EUROMOD figures for 2017-2020 for all countries, except for the UK, are based on SILC 2018 (2017 incomes). For the UK, results are based on FRS 2017/18.

6. Conclusions

The results from EUROMOD shown above are limited to some key statistical indicators of the baselines for 2017-2020 policies. On the one hand improvements and refinements are possible that will improve the quality, comparability and applicability of the baseline results. On the other hand, EUROMOD is not just intended to generate baseline statistics for a particular policy year; its main purpose is to be used as a tool to explore alternative scenarios in terms of both policies and the characteristics of the populations on which they have an impact on. Steps to improve EUROMOD's simulations of existing policy systems might include:

- Consideration of adjustments to improve the baseline in relation to external statistics while at the same time maintaining transparency in the model and its responsiveness to the effects of simulated policy changes. Adjustments for non-take-up of benefits and evasion of taxes remain one important area for future work. Another is improving understanding of when and how EUROMOD simulations better capture the situations of households than variables that may be under- or misreported in surveys.

- Consideration of how to account for changes in labour markets or demographics so that simulations for recent years can also take account of the effects of economic shocks and the

economic cycle in the period since the data were collected as well as demographic trends. Research performed on 27 EU countries suggests that in countries where there have been significant changes such adjustments can make a considerable difference to estimates of poverty and inequality and the effects of policies.[12] An experiment to explore using re-weighting to adjust for demographic change has been conducted by Kump and Navicke (2014).

- Continued explorations in how to improve the precision and level of detail (as well as cross-country consistency) in the treatment of the updating of non-simulated incomes from the data to the policy year.

- An additional area for development is the expansion of the number of countries using the disaggregated benefit variables now included in EU-SILC since 2014 for some countries. These are likely to improve the imputation of non-simulated benefits and hence the simulations.

References

Fernandez Salgado M., Figari, F, Sutherland, H. and Tumino, A (2013) "Welfare compensation for unemployment in the Great Recession", *Review of Income and Wealth,* 60(S1), 177-204.

Gasior K. and Rastrigina O. (2017) *Nowcasting: timely indicators for monitoring risk of poverty in 2014-2016,* Social Situation Monitor Research Note 1/2016.

Kump N. and Navicke J. (2014), Re-weighting EUROMOD for demographic change: an application on Slovenian and Lithuanian data, EUROMOD Working Paper Series EM13/14.

Kneeshaw, J. (2020), Baseline results from the EU28 EUROMOD (2016-2019), EUROMOD Working Paper Series, EM20/2020.

Sutherland, H. and Figari, F. (2013), EUROMOD: the European Union tax-benefit microsimulation model, *International Journal of Microsimulation*, 1(6), pp. 4-26.

[12] See Gasior and Rastrigina (2017).

Appendix 1. EUROMOD input datasets used in the analysis in this paper

Country	Base Dataset for EUROMOD	Year of collection	Income reference period	Simulated policy years
Belgium	EU-SILC 2018-1	2018	2017	2017-2020
Bulgaria	EU-SILC 2018-1	2018	2017	2017-2020
Czechia	EU-SILC 2018-1 & national SILC (Životní podmínky) variables	2018	2017	2017-2020
Denmark	EU-SILC 2018-1	2018	2017	2017-2020
Germany	EU-SILC 2018-1	2018	2017	2017-2020
Estonia	EU-SILC 2018-1	2018	2017	2017-2020
Ireland	EU-SILC 2018-2	2018	2017	2017-2020
Greece	EU-SILC 2018-1	2018	2017	2017-2020
Spain	EU-SILC 2018-1	2018	2017	2017-2020
France	EU-SILC 2018-1	2018	2017	2017-2020
Croatia	EU-SILC 2018-1	2018	2017	2017-2020
Italy	Special release of 2018 National SILC	2018	2017	2017-2020
Cyprus	EU-SILC 2018-1	2018	2017	2017-2020
Latvia	EU-SILC 2018-1	2018	2017	2017-2020
Lithuania	EU-SILC 2018-1	2018	2017	2017-2020
Luxembourg	EU-SILC 2018-1	2018	2017	2017-2020
Hungary	EU-SILC 2018-1	2018	2017	2017-2020
Malta	EU-SILC 2018-2	2018	2017	2017-2020
Netherlands	EU-SILC 2018-1	2018	2017	2017-2020
Austria	National data base 2018, version August 2018 + variables from EU-SILC 2018-1	2018	2017	2017-2020
Poland	EU-SILC 2018-1	2018	2017	2017-2020
Portugal	EU-SILC 2018-2	2018	2017	2017-2020
Romania	EU-SILC 2018-1	2018	2017	2017-2020
Slovenia	EU-SILC 2018-1	2018	2017	2017-2020
Slovakia	National SILC 2018 version 06/02/2020	2018	2017	2017-2020
Finland	EU-SILC 2018-1	2018	2017	2017-2020
Sweden	EU-SILC 2018-1	2018	2017	2017-2020
United Kingdom	Family Resources Survey 2017/18	2017/2018	2017/2018	2017-2020

Appendix 2. National teams contributing to EUROMOD I3.0+

Country	National team – team leader
Belgium	University of Antwerp – Gerlinde Verbist K.U.Leuven – André Decoster
Bulgaria	University of National and World Economy (UNSS), Sofia – Ekaterina Tosheva
Czechia	CERGE-EI – Daniel Münich
Denmark	Roskilde University - Bent Greve
Germany	DIW Berlin (Deutsches Institut für Wirtschaftsforschung) – Peter Haan
Estonia	PRAXIS Center for Policy Studies – Märt Masso
Ireland	Economic and Social Research Institute (ESRI) – Claire Keane
Greece	Athens University of Economics and Business (AUEB) – Panos Tsakloglou
Spain	Instituto de Estudios Fiscales (IEF) – Noemí Villazán and María Navas
France	Université de la Méditerranée, Marseille – Laurence Bouvard
Croatia	Institute of Public Finance – Ivica Urban
Italy	Bocconi University – Carlo Fiorio
Cyprus	Ministry of Labour, Welfare and Social Insurance – Costas Stavrakis
Latvia	Baltic International Centre for Economic Policy Studies (BICEPS) Anna Zasova
Lithuania	Vilnius University – Jekaterina Navicke
Luxembourg	LISER – Nizamul Islam
Hungary	TÁRKI Social Research Institute – Péter Szivós
Malta	Ministry of Finance, the Economy and Investment - Godwin Mifsud
Netherlands	CentERdata – Klaas de Vos
Austria	European Centre for Social Welfare Policy and Research – Michael Fuchs
Poland	Center for Economic Analysis (CenEA) – Michal Myck
Portugal	Lisboa School of Economics & Management - Carlos Farinha Rodrigues
Romania	National Research Institute for Labour and Social Protection - Eva Militaru
Slovenia	Inštitut za Ekonomska Raziskovanja (IER) – Boris Majcen and Nataša Kump
Slovakia	Ministry of Finance of the Slovak Republic – Martin Miklos and Dusan Paur
Finland	Research Department of the Social Insurance Institution of Finland (KELA) – Tapio Räsänen
Sweden	Ministry of Health and Social Affairs – Mattias Ossowicki and Statistics Sweden - Gunnar Holm and Annica Wallera
United Kingdom	Institute for Social and Economic Research (ISER) – Iva Tasseva

Appendix 3. Country notes: tax evasion and benefit non take up

Tax evasion

For **Bulgaria** tax evasion adjustments have been made because of oversimulation of taxes and social insurance contributions. The adjustment is based on a comparison between net and gross employment incomes. Under this approach, it is assumed that an individual is involved in the shadow economy if her (positive) net and gross employment incomes are equal. Such an individual is assumed to be a full tax evader and hence, no income tax and social insurance contributions are simulated for her. Furthermore, for the simulation of the income test for child and social assistance benefits, the earnings of a tax evader are not taken into account because it is assumed that they will not be reported and thus, will not be part of the income test. No correction for individuals with self-employment income has been done. These adjustments lead to more accurate simulations of the tax and benefit instruments.

For **Greece** tax evasion adjustments have been made on the basis of external estimates for the extent of average income underreporting by income source (earnings, self-employment income from farming and non-farm business). Assuming that net incomes reported in SILC reflect true incomes, two sets of gross incomes have been derived – one under the assumption of full compliance and the other assuming that everyone have underreported a given income source to the tax authority by the same proportion. A user can choose which assumption is utilised for calculating disposable incomes, and the model automatically draws on the relevant set of gross incomes. Adjustments for tax evasion are used by default for the baseline scenarios.

For **Italy** self-employment income has been calibrated in order to take into account tax evasion behaviour. Since we implement our own net-to-gross procedure (starting from net incomes reported in SILC data), we split the recorded self-employment income into two components: the first component declared to the tax authorities (and hence grossed up) and the second component not declared (but still included in the definition of disposable income). The coefficient used to separate the two components allows us to get a total aggregate gross self-employment income corresponding to the aggregate amount of reported self-employment income as reported in the official statistics.

For **Romania** all self-employed in agriculture living in rural areas and with a self-employment income below the average wage are assumed to evade taxes.

Full compliance is assumed for both income taxes and social insurance contributions for the rest of the countries.

Benefit non take-up

For **Belgium** and the **UK** we employ a simple non take-up correction of the main means-tested benefits by applying the take-up proportions estimated on a caseload basis (own calculations in case of Belgium; using statistics from the Department of Work and Pensions and HM Revenue and Customs in case of the UK). Take-up probabilities are applied at the household level (so that people entitled to the same benefits within a household exhibit the same take-up behaviour), for each benefit separately. In general we assume that take-up behaviour is not affected by changes in the size of benefit or tax credit entitlements. However, by applying differential take-up probabilities according to type of claimant in the UK, some of this effect is captured.

For **Bulgaria** in **2015** for the value of the minimum wage. In **2016** for the income-test threshold to calculate entitlements to the means-tested child benefit, child benefit for education and non-contributory benefit for raising a child under the age of 1.

For **Estonia** non take-up is simulated for social assistance on the assumption that small entitlements

(either in absolute or relative to other household income) are not claimed. Full take-up is assumed for all other simulated means-tested benefits.

For **France** non take-up correction of the main means-tested social assistance benefit (RMI/RSA)[13] is simulated to be random- proportions of non-take up -separately by active and inactive units (for RSA) taken from external data.

For **Ireland**, non take-up is simulated for Family Income Supplement, applying external estimates on the caseload. Full take-up is assumed for all other means-tested simulated benefits.

For **Greece** a random non take-up correction is simulated for unemployment assistance benefit for long-term unemployed. The receipt of social dividend (a lump-sum benefit only provided in 2014) was restricted to the amount of the primary budget surplus that was allocated to the benefit, i.e. approximately €450 million. The beneficiaries of food stamps and rent allowance (two benefits only provided in 2015 and 2016) were also calibrated to guarantee consistency with the official statistics. Full take-up is assumed for all other simulated means-tested benefits.

For **Croatia**, non take-up is simulated for subsistence benefit on the assumption that small entitlements (i.e. smaller than 3% of the average net wage) are not claimed. Full take-up is assumed for all other simulated means-tested benefits.

For **Latvia** non take up is simulated for paternity benefit based on the benefit receipt observed in the data.

For **Poland** full take up is assumed in the simulation of nursing supplement, nursing allowance, family allowance, family supplements, birth allowance, nursing benefit and permanent social assistance. In general, the simulated number and amount of benefits are consistent with official statistics. However, for housing benefit, due to significant differences between the number of recipients simulated by the model (assuming full take up) and reported in official statistics, eligibility is conditional on receipt being reported in the input database. Furthermore, due to lack of information on assets that are necessary for the means-test, the eligibility for temporary social assistance is simulated conditional on an estimated expected probability to be eligible. Moreover, by law the central government is obliged to pay just a share of the total benefit amount. The rest (or part of it) may be paid by the local government. In EUROMOD, we assume that only the central government pays its part.

For **Portugal** full take up is assumed in the simulation of all means-tested benefits. However, given the inability of simulating all eligibility conditions for the social solidarity supplement for the elderly, the simulation of this benefit overestimates the number of recipients and aggregate amounts. Thus, the beneficiaries were calibrated to guarantee consistency with the official statistics.

For **Romania** non take-up is simulated for the minimum guaranteed income, which under full take-up is overestimated by a factor of 4. The calibration is based on the assumption that households headed by a person under 25 do not claim. Means-tested benefits for lone parents are underestimated by a factor of 2 due to a lack of lone parents in the data.

In **Finland** eligibility for income support is assessed at the family level (rather than at the household level). For example, adult children can apply separately from their parents. In practice, however, this happens rarely. Therefore, in the model we account for non take-up by simulating income test at the household level. Also, the households where the head is self-employed are excluded from eligibility (as they rarely apply for income support).

In **Spain** a non take-up adjustment is simulated for the regional minimum income schemes. These regional benefits are overestimated in EUROMOD due to (i) the non-simulation of some eligibility conditions, by cause of lack of information in EU-SILC, (ii) the non-take-up by potential beneficiaries, and (iii) the existence of different regional budget constraints and bureaucratic

procedures across regions. The calibration aligns both the simulated number of beneficiaries and total expenditure by region with the figures obtained from official statistics.

Full take-up is assumed for all simulated means-tested benefits for the remaining EU countries.

[13] RMI stands for Revenu minimum d'insertion and RSA for Revenu de solidarité active.

Appendix 4. Country notes: Full year adjustments

It is possible to use full year adjustment in the following countries:

For **Estonia** in **2007** for child allowance and allowance for families with 3+ children. In **2009** for unemployment insurance benefit, employer social insurance contribution, credited social insurance contribution, employee social insurance contribution and self-employed social insurance contribution. In **2013** for child allowance and needs based family benefit. In **2017** for parental allowance for families with 7+ children / many children.

For **Greece** in **2010** for pensioners' solidarity contributions. In **2011** for pensioners' solidarity contributions, temporary pension reduction, SIC: private sector employers and SIC: self-employed liberal professions. In **2013** for SIC: banking employees, SIC: public enterprise employees and SIC: civil servants. In **2014** for SIC: private sector employers and SIC: banking employees (ETE). In **2015** for pensioners' SIC, food stamps and rent allowance. In **2016** for temporary pension reduction and supplementary pension recalculation. In **2017** for gross pensions cap and guaranteed minimum income. In **2019** for employees' and employers' social insurance contribution for supplementary pensions.

For **Spain** in **2015** for Personal Income Tax. In **2018** for self-employed SIC. In **2020** for credited SIC in case of wage compensation and for the simulation of the new national-wide minimum income.

For **Czechia** in **2020** for the change in the Minimum Living Standard (MLS) index.

For **Slovakia** in **2019** for child benefit.

For **Lithuania** in **2017** for unemployment insurance benefit.

For **Netherlands** in **2015** for Social Assistance Benefit (net).

For **Portugal** in **2012** for Social insertion income.